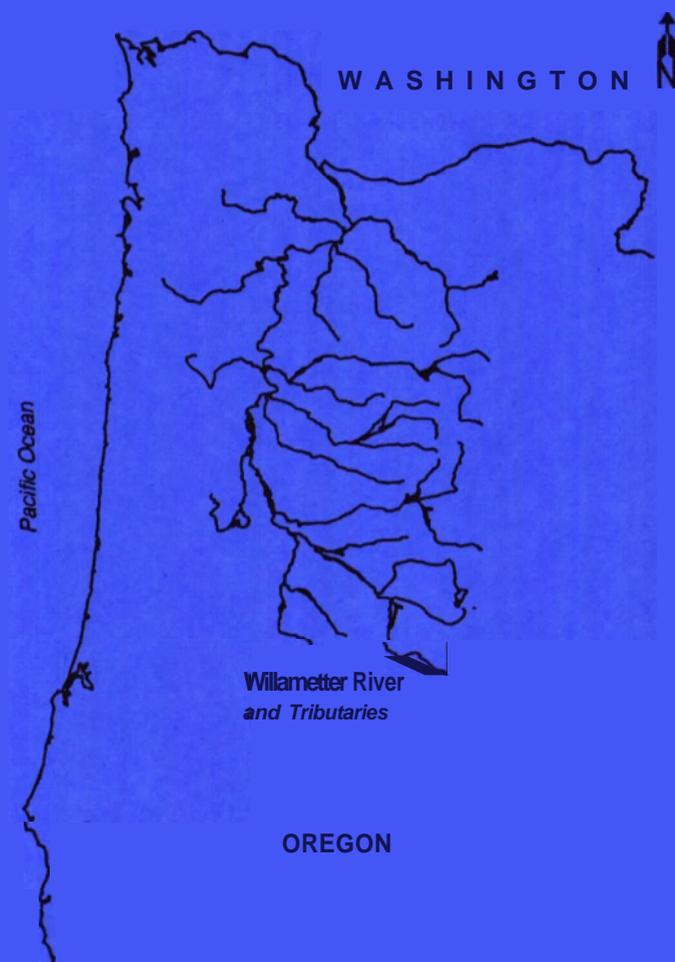


# Recovery Plan for the Oregon Chub (*Oregonichthys crameri*)



**OREGON CHUB**  
(*Oregonichthys crameri*)

**Recovery Plan**

Prepared by:

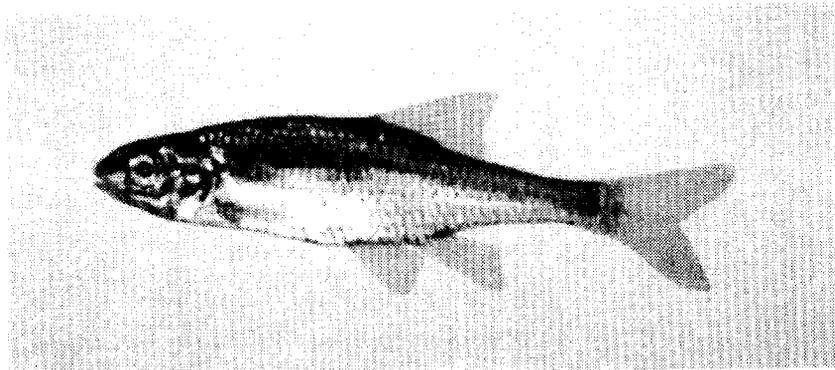
U.S. Fish and Wildlife Service  
Oregon State Office  
Portland, Oregon

for

Region 1  
U.S. Fish and Wildlife Service  
Portland, Oregon

Approved: *Anne Badgley*  
Regional Director, U.S. Fish and Wildlife Service

Date: 9/3/48



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## Oregon Chub

## DISCLAIMER PAGE

Recovery plans delineate reasonable actions which are believed to be required to recover and/or protect listed species. We (the U.S. Fish and Wildlife Service) publish plans. They are sometimes prepared with the assistance of recovery teams, contractors, State agencies, and others. Objectives will be attained and any necessary funds made available subject to budgetary and other constraints affecting the parties involved, as well as the need to address other priorities. Recovery plans do not necessarily represent the views nor official positions or approval of any individuals or agencies involved in the plan formulation, other than our own. They represent our official position **only** after they have been signed by the Regional Director or Director as **approved**. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and the completion of recovery tasks.

LITERATURE CITATION: U.S. Fish and Wildlife Service. 1998. Oregon Chub (*Oregonichthys crameri*) Recovery Plan. Portland, Oregon. 69+ pp.

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The fee for the Plan varies depending on the number of pages of the Plan.

## ACKNOWLEDGMENTS

This recovery plan was prepared by Cat Brown, Ron Rhew, and Antonio Bentivoglio (U.S. Fish and Wildlife Service) and Paul Scheerer (Oregon Department of Fish and Wildlife).

Valuable input was received during the preparation of this plan from the Oregon Chub Working Group, which consists of representatives from the following Federal and State agencies that have an interest in the recovery of the Oregon chub:

- U.S. Fish and Wildlife Service - Refuges
- U.S. Forest Service
- U.S. Army Corps of Engineers
- Oregon Department of Fish and Wildlife
- Oregon Department of Parks and Recreation
- Oregon Department of Transportation
- Oregon State University

## **EXECUTIVE SUMMARY OF THE OREGON CHUB RECOVERY PLAN**

Current Status: This species was listed as endangered in 1993. Twenty-four populations are known to exist. Only 7 of these populations exceed 1,000 fish and 12 populations contain fewer than 100 individuals. The species was historically found throughout the Willamette River Valley of western Oregon.

Habitat Requirements and Limiting Factors: Oregon chub are found in slack water off-channel habitats such as beaver ponds, oxbows, side channels, backwater sloughs, low gradient tributaries, and flooded marshes. In the last 100 years, backwater and off-channel habitats have disappeared because of changes in seasonal flows resulting from the construction of dams throughout the basin, channelization of the Willamette River and its tributaries, removal of snags for river navigation, and agricultural practices. Current threats to Oregon chub include continued habitat alteration; the proliferation of non-native fish and amphibians; accidental chemical spills; runoff from herbicide or pesticide application on farms, timberlands, or along roadways, railways, and power line rights-of-way; desiccation of habitats; unauthorized water withdrawals, diversions, or fill and removal activities; and sedimentation resulting from timber harvesting in the watershed.

Recovery Objective: The ultimate objective of this plan is to delist the Oregon chub, however, criteria for downlisting to threatened are also established.

Recovery Criteria: This species will be considered for downlisting when the following criteria have been met: 1) Establish and manage 10 populations of at least 500 adults each; 2) all of these populations must exhibit a stable or increasing trend for 5 years; 3) at least three populations must be located in each of the three sub-basins (Mainstem Willamette River, Middle Fork Willamette River and Santiam River). A stable or increasing population size would be identified by quantifying the normal fluctuations in species numbers as a trend through the 5 years of surveys which would be done consistently at the same time each year, most likely in the fall.

This species can be considered for delisting when 20 populations of at least 500 individuals each are established and maintained. All of these populations must exhibit a stable or increasing trend for 7 years. At least four populations must be located in each of the three sub-basins (Mainstem Willamette, Middle Fork Willamette and Santiam). Management of these 20 populations must be guaranteed in perpetuity.

Actions Needed:

1. Manage existing sites.
2. Establish new populations.
3. Research into the attributes of suitable habitats, spawning cues, survival rates, and effects of non-native predators and competitors.
4. Public education and outreach to foster greater understanding of the Oregon chub, its status, the factors that influence its populations, and its role in the natural environment of the Willamette Valley.

Costs (\$1,000's):

<u>Year</u>	<u>Need 1</u>	<u>Need 2</u>	<u>Need 3</u>	<u>Need 4</u>	<u>Total</u>
1998	169	30	25	10	234
1999	238	55	50	12	355
2000	235	55	25	12	327
2001	<u>210</u>	<u>55</u>	<u>20</u>	<u>12</u>	<u>297</u>
Total:	852	195	120	46	1,213

Total Estimated Cost of Recovery: \$1,732,000

Date of Recovery: To be determined pending further research.

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## PART I. INTRODUCTION

The Oregon chub (*Oregonichthys crameri*) is a small minnow (Family: Cyprinidae) endemic to the Willamette River Basin in western Oregon. We (the U.S. Fish and Wildlife Service) listed the chub as endangered in 1993 (58 FR 53800 ). Critical habitat for the species has not been designated.

### A. Taxonomy and Species Description

The Oregon chub was first described by Snyder in 1908 as *Hybopsis crameri*, and considered to be the sole western member of the genus *Hybopsis* (Long 1982, Markle *et al.* 1991). Subsequent taxonomic revisions include placing the chub in the monotypic genus *Oregonichthys* in 1929, and again within *Hybopsis* in 1951 (Markle *et al.* 1991). Further revision of *Hybopsis* recognized several subgenera including *Oregonichthys* (Markle *et al.* 1991) and the treatment once again of *Oregonichthys* as a monotypic genus by Maden (Pearsons 1989). The genus *Oregonichthys* is endemic to the Umpqua and Willamette Rivers of western Oregon. In the past, the common name “Oregon chub” has been used to refer to all *Oregonichthys* from both of these drainages. However, the Umpqua River form of *Oregonichthys* (*O. kalawatseti*) was formally described by Markle *et al.* (1991), and is taxonomically distinct from *Oregonichthys* in the Willamette River which retains the earlier name of *O. crameri*. Use of the term “Oregon chub” therefore refers only to *O. crameri*. We gave this species a recovery priority number of 11 meaning that it has a moderate degree of threat and a low recovery potential.

In color, Oregon chub and its sibling Umpqua chub have an olive colored back (dorsum) grading to silver on the sides and white on the belly (Markle *et al.* 1991). Adults are typically under 9 centimeters (3.5 inches) in length. Scales are relatively large with fewer than 40 occurring along the lateral line; scales near the back are outlined with dark pigment (Markle *et al.* 1991, Bond 1994). The main distinguishing characteristics between Oregon and Umpqua chub are: the length of the caudal peduncle is greater in the Oregon chub; the breast is mostly scaled on Oregon chub versus three fourths to fully naked on Umpqua chub; and mouth position is more terminal on Oregon chub versus subterminal on Umpqua chub

(Markle *et al.* 1991, Bond 1994).

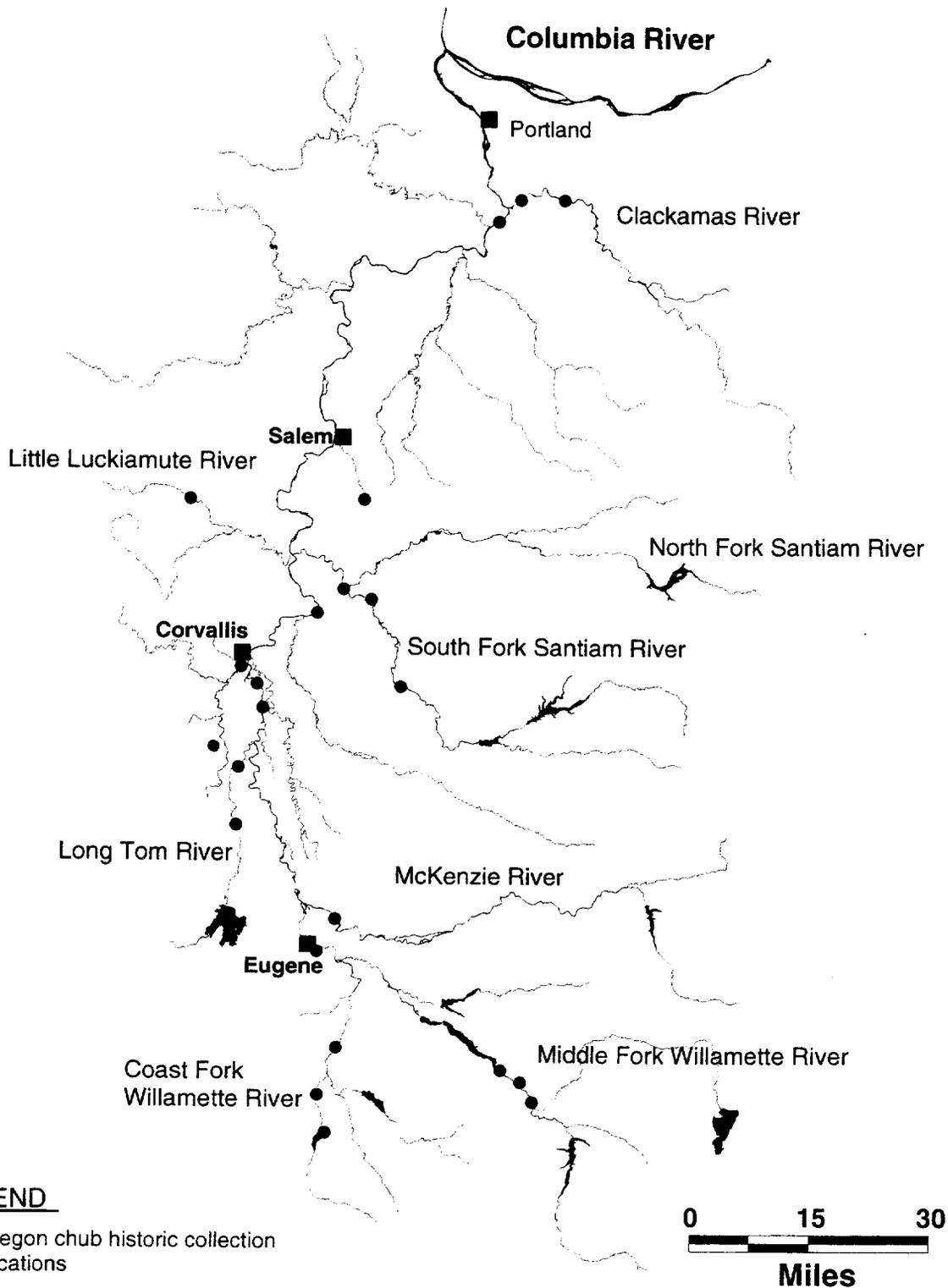
Several size classes of Oregon chub have been collected. Young of the year are 7 to 32 millimeters (0.25 to 1.25 inches), Oregon chub presumed to be 1-year-old are 33 to 46 millimeters (1.25 to 1.75 inches), presumed 2-year-olds are 47 to 64 millimeters (1.75 to 2.5 inches), and presumed 3-year-old fish are more than 65 millimeters (2.5 inches) (Pearsons 1989). The largest Oregon chub on record was collected from the Santiam River and measured 89 millimeters (3.5 inches) (Scheerer *et al.* 1995).

## **B. Distribution**

Oregon chub are endemic to the Willamette River drainage of western Oregon (Markle *et al.* 1991). This species was formerly distributed throughout the Willamette River Valley in off-channel habitats such as beaver ponds, oxbows, side channels, backwater sloughs, low gradient tributaries, and flooded marshes (Snyder 1908). Historical records show Oregon chub were found as far downstream as Oregon City and as far upstream as Oakridge. Historical records also report Oregon chub were collected from the Clackamas River, Molalla River, South Santiam River, North Santiam River, Luckiamute River, Long Tom River, McKenzie River, Mary's River, Coast Fork Willamette River, Middle Fork Willamette River, and the Mainstem Willamette River from Oregon City to Eugene (Markle *et al.* 1991) (Figure 1).

The current distribution of Oregon chub is limited to 20 known naturally occurring populations and 4 recently reintroduced populations (Table 1). The naturally occurring populations are found in the Santiam River, Middle Fork Willamette River, Coast Fork Willamette River, and several tributaries to the Mainstem Willamette River downstream of the Coast Fork/Middle Fork confluence. Only 7 of these populations exceed 1,000 fish and 12 populations contain fewer than 100 individuals. Four populations of Oregon chub have been reintroduced into habitats within the Willamette River watershed at Wicopee Pond, East Ferrin Pond, Fall Creek Spillway Pond, and Dunn Wetland.

In the last 100 years, backwater and off-channel habitats have disappeared



**Figure 1. Historic distribution of Oregon chub in the Willamette River basin (from Markle 1991).**

**Table 1. Existing Oregon Chub Recovery Sites**

<b>SITE</b>	<b>LANDOWNER</b>	<b>POPULATION ESTIMATE (1997)</b>	<b>TREND</b>	<b>MANAGEMENT PRIORITY<sup>1</sup></b>	<b>OTHER SENSITIVE SPECIES PRESENT</b>
<b>SANTIAM RIVER SUB-BASIN</b>					
Geren Island	City of Salem	1,830	Declining	1	Red-legged frog
Santiam Conservation Easement	Private	260	Declining	2	Red-legged frog, pond turtle
Greens Bridge Backwater	Private	<100	Stable	2	
Santiam I-5 Backwater	Oregon Dept. of Transportation	<100	Stable	2	None
Pioneer Park Backwater	City of Stayton	<100	Declining	2	None
Gray Slough	Private	<100	Declining	2	Red-legged frog, pond turtle
<b>MAINSTEM WILLAMETTE RIVER SUB-BASIN</b>					
William L. Finley National Wildlife Refuge - Gray Swamp	US Fish and Wildlife Service	520	Stable	1	Pond turtle
Camous Creek	Private	<100	Stable	3	
Dry Muddy Creek	Private	<100	Stable	3	
Dunn Wetland*	Private	200	Unknown	1	Red-legged frog, pond turtle

**Table 1. (cont.)**

<b>SITE</b>	<b>LANDOWNER</b>	<b>POPULATION ESTIMATE (1997)</b>	<b>TREND</b>	<b>MANAGEMENT PRIORITY<sup>1</sup></b>	<b>OTHER SENSITIVE SPECIES PRESENT</b>
<b>COAST FORK WILLAMETTE RIVER SUB-BASIN</b>					
Camas Swale	Private	<100	Declining	3	
<b>MIDDLE FORK WILLAMETTE RIVER SUB-BASIN</b>					
East Fork Minnow Creek Pond	Oregon Dept. of Transportation	4,020	Declining	1	Red-legged frog, pond turtle
Shady Dell Pond	Willamette National Forest	3,790	Stable	1	Red-legged frog, pond turtle
Elijah Bristow State Park	Oregon Dept. of Parks and Rec.	5,350	Increasing	1	Pond turtle
Hospital Pond	US Army Corps of Engineers	3,030	Increasing	1	Pond turtle
Dexter Reservoir Alcoves	US Army Corps of Engineers	2,250	Increasing	1	
Rattlesnake Creek	Private	<100	Stable	2	
Oakridge Slough	Willamette National Forest	<100	Stable	2	Pond turtle
Jasper Park Slough	County/Private	<100	Declining	3	

**Table 1. (cont.)**

<b>SITE</b>	<b>LANDOWNER</b>	<b>POPULATION ESTIMATE (1997)</b>	<b>TREND</b>	<b>MANAGEMENT PRIORITY<sup>1</sup></b>	<b>OTHER SENSITIVE SPECIES PRESENT</b>
Buckhead Creek	Willamette National Forest	<100	Stable	2	Red-legged frog, pond turtle
East Ferrin Pond*	Willamette National Forest	5,600	Increasing	1	Pond turtle
Wicopee Pond*	Willamette National Forest	25	Stable	2	Red-legged frog
Fall Creek Spillway Pond*	US Army Corps of Engineers	480	Unknown	1	Pond turtle, Red-legged frog
Wallace Slough	Private	<100	Declining	2	None

<sup>1</sup> Management Priority:

1 = large population in high quality natural habitats;

2 = low population numbers in relatively natural habitat conditions;

3 = low population numbers, highly altered habitat and difficult to manage.

\* denotes reintroduced population.

rapidly because of changes in seasonal flows resulting from the construction of dams throughout the basin, channelization of the Willamette River and its tributaries, removal of snags for river navigation, and agricultural practices (Figure 2). A variety of non-native aquatic species was introduced to the Willamette Valley over the same period. Consequently, these activities reduced available Oregon chub habitat, isolated the existing Oregon chub populations, restricted mixing between populations, reduced the probability of successful recolonization by Oregon chub, and introduced new competitors and predators into Oregon chub habitat. In 1983, Carl Bond and James Long of Oregon State University noted that Oregon chub were becoming rare in the Willamette River and suggested some efforts might be necessary to protect this species (Bond and Long 1984). In 1989, Pearsons surveyed historical locations of Oregon chub populations and documented the decline of this species (Pearsons 1989). This prompted the petition for listing Oregon chub as a Federal endangered species in 1990 (Markle, *in litt* 1990.), and the subsequent Federal listing in 1993.

Oregon chub in the Willamette River drainage are not separated into distinct population segments. Historically, there was downstream mixing, and limited upstream mixing of chub populations throughout the basin. Currently, the species is distributed among four sub-basins of the Willamette River: Mainstem Willamette, Middle Fork Willamette, Coast Fork Willamette, and Santiam (Figure 3). No genetic studies have been conducted to provide information regarding the amount of variability or distinctness between populations.

Of the 24 known Oregon chub populations, the sites with the highest diversity of native fish, amphibian, and reptile species have the largest populations of Oregon chub (Scheerer and Apke 1998). Beaver (*Castor canadensis*) appear to be especially important in creating and maintaining habitats that support these diverse native species assemblages (Scheerer and Apke 1998).

### **C. Habitat**

Oregon chub are found in slack water off-channel habitats such as beaver ponds, oxbows, side channels, backwater sloughs, low gradient tributaries, and flooded marshes. These habitats usually have little or no water flow, silty and

# Willamette River

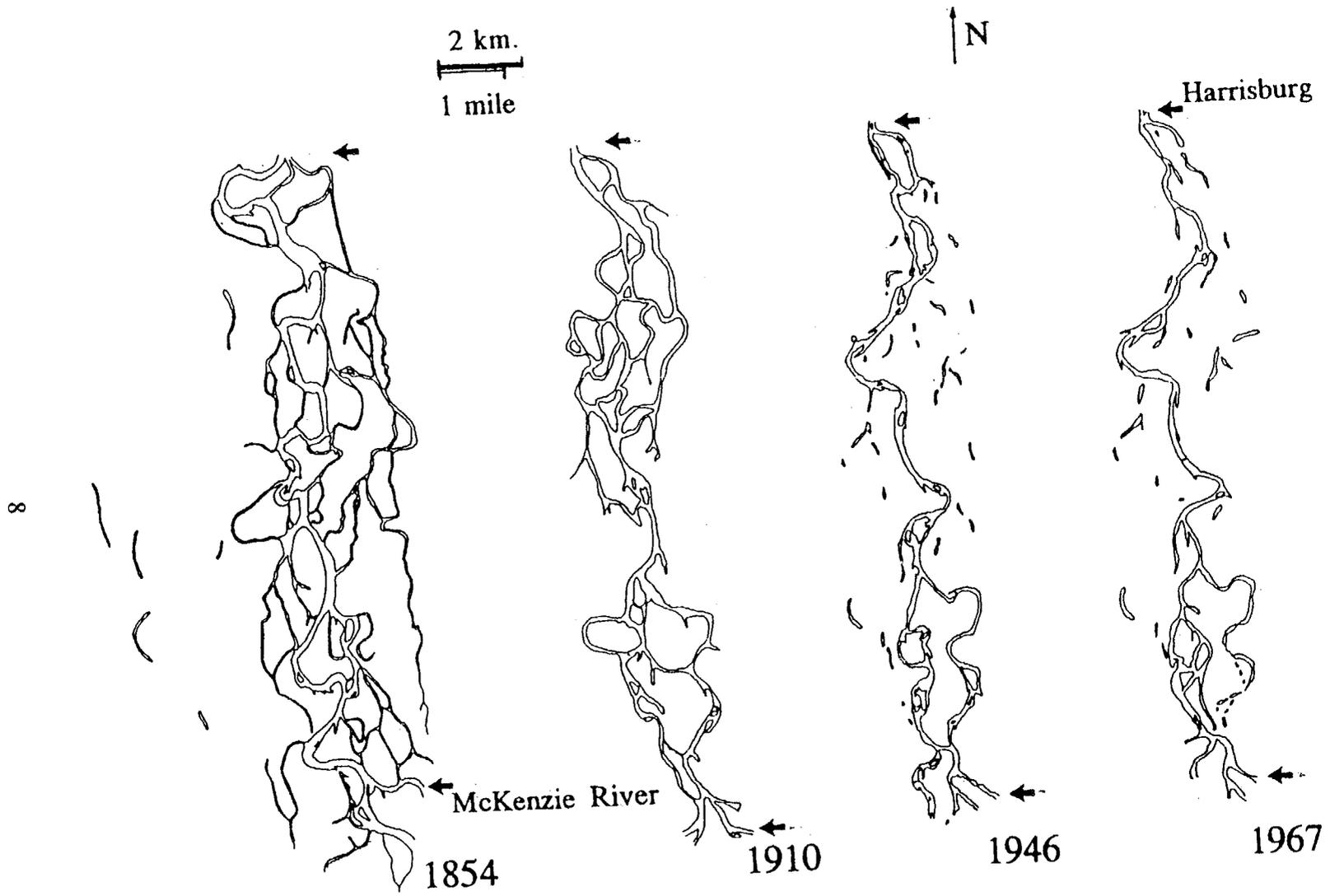


Figure 2. Willamette River - past and present (from Sedell and Froggatt 1984).

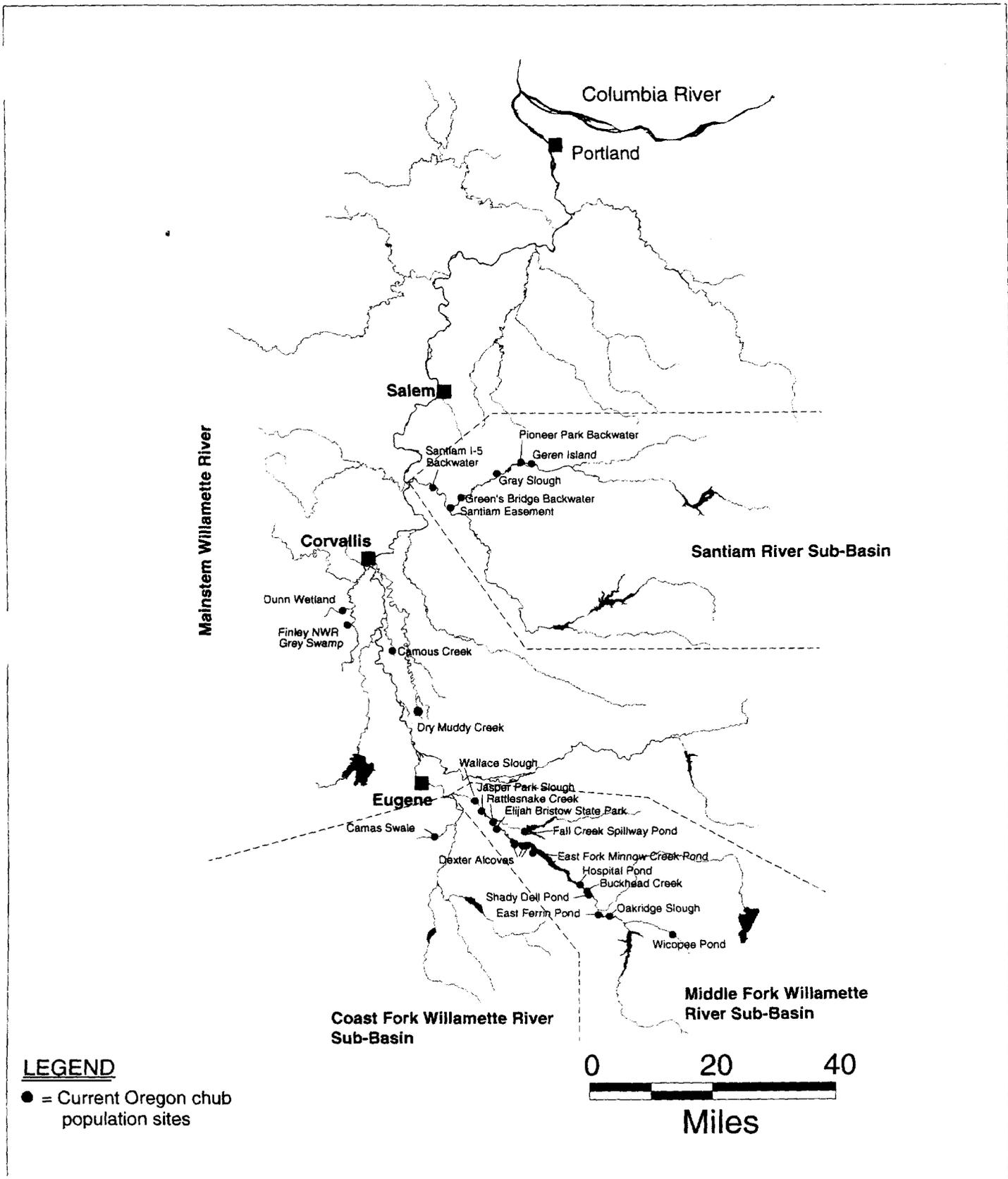


Figure 3. Sub-Basins with current Oregon chub population sites.

organic substrate, and considerable aquatic vegetation as cover for hiding and spawning (Pearsons 1989; Markle *et al.* 1991; Scheerer *et al.* 1992, 1993, 1994, 1995, 1996; Scheerer and Jones 1997). The average depth of Oregon chub habitats is typically less than 2 meters (6 feet) and the summer temperatures typically exceed 16 degrees Celsius (61 degrees Fahrenheit). Adult Oregon chub seek dense vegetation for cover and frequently travel in the mid-water column in beaver channels or along the margins of aquatic plant beds. Larval chub congregate in near shore areas in the upper layers of the water column in shallow areas (Pearsons 1989, Scheerer 1997). Juvenile Oregon chub venture farther from shore into deeper areas of the water column (Pearsons 1989). In the winter months, Oregon chub can be found buried in the detritus or concealed in aquatic vegetation (Pearsons 1989). Fish of similar size classes school and feed together. In the early spring, Oregon chub are most active in the warmer, shallow areas of the ponds.

The Oregon chub evolved in a dynamic network of slack water habitats in the floodplain of the Willamette River. Major alteration of the Willamette River for flood control and navigation improvements has eliminated most of the river's historic floodplain. This alteration has also impaired or eliminated the environmental conditions in which the Oregon chub evolved. Remaining suitable habitats have been invaded by non-native fish predators and competitors. Recovery efforts for the species will therefore focus on creation and management of isolated, manageable habitats, particularly ponds and other slow water environments. Thus, although the Oregon chub evolved as a fish of slow-moving streams and sloughs, near-term persistence of the species will depend on its ability to survive and thrive in more isolated habitats.

## **D. Life History**

### **1. Reproduction**

Oregon chub spawn from April through September. Before and after spawning season, chub are social and non-aggressive. Spawning behavior, as described by Pearsons (1989), begins with the male establishing a territory in or near dense aquatic vegetation. If an adult male enters the territory of another

male, aggressive skirmishes occur. When an adult female enters the territory the courting begins with head rubbing behavior, where the male rubs his head in the ventral region of the female between the pectoral and anal fins. The female is then directed into the aquatic vegetation by slight changes in the angle and pressure of the head on the lateral undersides of the female. Twirling of both fish, arranged head to head and tail to tail, follows and eggs and sperm are released. Twirling behavior is rarely observed; however, the territorial behavior, head rubbing, and directing occur only during spawning (Pearsons 1989). Observation of these behaviors is recorded as spawning activity. Spawning activity has only been observed at temperatures exceeding 16 degrees Celsius (61 degrees Fahrenheit). Males over 35 millimeters (1.4 inches) have been observed exhibiting spawning behavior.

## **2. Food Habits**

Oregon chub are obligatory sight feeders (Davis and Miller 1967). They feed throughout the day and stop feeding after dusk (Pearsons 1989). Chub feed mostly on water column fauna. The diet of Oregon chub adults collected in a May sample consisted primarily of minute crustaceans including copepods, cladocerans, and chironomid larvae (Markle *et al.* 1991). The diet of juvenile chub also consisted of minute organisms such as rotifers, copepods, and cladocerans (Pearsons 1989).

## **E. Reasons for Decline**

A variety of factors are likely responsible for the decline of the Oregon chub. These include habitat alteration; the proliferation of non-native fish and amphibians; accidental chemical spills; runoff from herbicide or pesticide application on farms and timberlands or along roadways, railways, and power line rights-of way; the application of rotenone to manage sport fisheries; desiccation of habitats; unauthorized water withdrawals, diversions, or fill and removal activities; sedimentation resulting from timber harvesting in the watershed, and possibly the demographic risks that result from a fragmented distribution of small, isolated populations.

## **1. Habitat Alteration**

Based on a 1987 survey (Markle *et al.* 1989) and compilation of all known historical records, at the time of the petition for listing in 1991, viable populations of the Oregon chub occurred in the following locations: Dexter Reservoir, Shady Dell Pond, Buckhead Creek near Lookout Point Reservoir, Elijah Bristow State Park, William L. Finley National Wildlife Refuge, Greens Bridge, and East Fork Minnow Pond. These locations represented a small fraction - estimated as 2 percent based on stream miles - of the species' formerly extensive distribution within the Willamette River drainage.

The decline of Oregon chub has been correlated with the construction of dams. Based on the date of last capture at a site, Pearsons (1989) estimated that the most severe decline occurred during the 1950's and 1960's. Eight of 11 flood control projects in the Willamette River drainage were completed between 1953 and 1968 (U.S. Army Corps of Engineers 1970). Other structural changes along the Willamette River corridor such as revetment and channelization, diking and drainage, and the removal of floodplain vegetation have eliminated or altered the slack water habitats of the Oregon chub (Willamette Basin Task Force 1969, Hjort *et al.* 1984, Sedell and Froggatt 1984, Li *et al.* 1987). Channel confinement, isolation of the Willamette River from the majority of its floodplain, and elimination or degradation of both seasonal and permanent wetland habitats within the floodplain began as early as 1872 and, for example, has reduced the 25 kilometer (15.5 mile) reach between Harrisburg and the McKenzie River confluence from over 250 kilometers (155 miles) of shoreline in 1854 to less than 64 kilometers (40 miles) currently (Sedell and Froggatt 1984, Sedell *et al.* 1990).

## **2. Predation and Competition with Non-native Species**

The establishment and expansion of non-native species in Oregon have contributed to the decline of the Oregon chub and limits the species' ability to expand beyond its current range. Many species of non-native fish have been introduced and are common throughout the Willamette Valley, including largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), crappie (*Pomoxis* sp.), bluegill (*Lepomis macrochirus*), and western

mosquitofish (*Gambusia affinis*). The bullfrog (*Rana catesbiana*), a non-native amphibian, also occurs in the valley and breeds in habitats preferred by the Oregon chub (Willamette Basin Task Force 1969, Hjort *et al.* 1984, Li *et al.* 1984, Scheerer *et al.* 1992). The period of severe decline of the Oregon chub does not coincide well with the initial dates of introduction of nonindigenous species. However, many sites formerly inhabited by the Oregon chub are now occupied by non-native species (Markle *et al.* 1989). Currently, 24 sites are known to contain Oregon chub; 15 of these sites are also inhabited by non-native fishes or amphibians (P. Scheerer, pers. comm. 1997; Scheerer and Jones 1997). Since 1995, non-native fish have been discovered for the first time in six locations containing Oregon chub; the Oregon chub populations have subsequently declined in all of these sites. The 1996 flooding in the Santiam River was probably responsible for three of these movements of non-native fish. The other three sites, located in the Middle Fork Willamette River drainage, were likely the result of unauthorized introductions or spread of non-native fish from reservoirs (Scheerer and Jones 1997).

Specific interactions responsible for the exclusion of Oregon chub from habitats dominated by non-native species is not clear in all cases. While information confirming the presence of Oregon chub in stomach contents of predatory fishes is lacking, many non-native fishes, particularly adult centrarchids (e.g., bass) and ictalurids (e.g., catfish) are documented piscivores (fish eaters) (Carlander 1969, Moyle 1976, Carlander 1977, Wydoski and Whitney 1979, Li *et al.* 1987). These fishes are frequently the dominant inhabitants of ponds and sloughs within the Willamette River drainage and may constitute a major obstacle to Oregon chub recolonization efforts. Adult bullfrogs prefer habitat similar in characteristics (i.e., little to no water velocity, abundant aquatic and emergent vegetation) to preferred habitat for Oregon chub, and are known to consume small fish as part of their diet (Cohen and Howard 1958, Bury and Whelan 1984). Non-native fishes may also serve as sources of parasites and diseases; however, disease and parasite problems have not been studied in the Oregon chub.

Observed feeding strategies and diet of introduced fishes, particularly juvenile centrarchids (e.g., bass, crappie) and adult mosquitofish (Li *et al.* 1987) and bullfrogs (Cohen and Howard 1958; Kane *et al.* 1992), in many cases overlap

with diet and feeding strategies described for Oregon chub (Pearsons 1989). This suggests that direct competition for food between Oregon chub and introduced species may further impede species survival as well as recovery efforts. The rarity of finding Oregon chub in waters also inhabited by mosquitofish may reflect many negative interactions, including but not limited to food-based competition, aggressive spatial exclusion, and predation on eggs and larvae (Dr. Douglas Markle, Oregon State University, pers. comm., 1997; Meffe 1983, 1984).

The threat of non-native fishes continues to grow; there is public pressure to develop additional sport fisheries in Lookout Point and Dexter Reservoirs (P. Scheerer, pers. comm., 1997). Because all remaining population sites are easily accessible, there also continues to be a potential for unauthorized introductions of non-native species, particularly mosquitofish and game fishes such as bass and walleye (*Stizostedion vitreum*).

### **3. Water Quality**

Many of the known extant populations of Oregon chub occur near rail, highway, and power transmission corridors and within public park and campground facilities. These populations are threatened by chemical spills from overturned truck or rail tankers; runoff or accidental spills of vegetation control chemicals; overflow from chemical toilets in campgrounds; sedimentation of shallow habitats from construction activities; and changes in water level or flow conditions from construction, diversions, or natural desiccation. Oregon chub populations near agricultural areas are subject to poor water quality as a result of runoff laden with sediment, pesticides, and nutrients. Logging in the watershed can result in increased sedimentation and herbicide runoff.

### **F. Recent Conservation Measures**

The Oregon Department of Fish and Wildlife conducted surveys throughout the Willamette River Valley from 1991 to 1997. The objectives of these surveys were to collect information on: 1) the distribution and abundance of Oregon chub; 2) the presence of non-native and native species; 3) the characteristics of historic Oregon chub habitats; 4) the characteristics of potential

reintroduction sites; and 5) to evaluate potential reintroduction sites. Surveys will continue as funding permits.

An organization called the Oregon Chub Working Group was formed in 1991 at the suggestion of the Oregon Department of Fish and Wildlife. The Working Group is a loose-knit group of Federal and State agency biologists, academics, land managers, and other concerned people who strive to improve the status of the species. Membership in the Working Group consists of representatives from the U.S. Fish and Wildlife Service, U.S. Forest Service, Army Corps of Engineers, Bureau of Land Management, Oregon Department of Fish and Wildlife, Oregon State University, Oregon Parks and Recreation Department, Oregon Department of Transportation, Oregon State Police, and others as appropriate. The Working Group has been proactive in conserving and restoring habitat for the Oregon chub and raising public awareness of the species since before the Federal listing in 1993.

In 1992, an interagency “Conservation Agreement for the Oregon Chub in the Willamette Valley, Oregon” was completed and signed by us (the U. S. Fish and Wildlife Service), the U. S. Forest Service, U. S. Army Corps of Engineers, Bureau of Land Management, Oregon Department of Fish and Wildlife, and Oregon Parks and Recreation Department (Appendix 1). The purpose of the coordinated plan was to facilitate Oregon chub protection and recovery and to serve as a guide for all agencies to follow as they conduct their missions. The goal of the plan was to reverse the declining trend of Oregon chub populations, and to increase the abundance of this species in healthy, wild populations through protection of habitat, reintroductions to suitable habitat within its historic range, and public education and involvement. The management objectives and guidelines are to: 1) establish a task force drawn from participating agencies to oversee and coordinate Oregon chub conservation and management actions; 2) protect existing populations; 3) establish new populations; and, 4) foster greater public understanding of the Oregon chub, its status, the factors that influence it, and the conservation agreement.

In October 1993, a Risk Assessment Analysis for Oregon chub was drafted by the Oregon Department of Fish and Wildlife. The purpose of the document

was to provide guidelines for the founding of new populations of Oregon chub. The document sets guidelines for numbers of fish to be used for introductions, genetic considerations in choosing donor populations, timing of introductions, and the monitoring protocol to determine the progress and success of introductions.

In July 1996, we (the U.S. Fish and Wildlife Service) prepared and signed, in coordination with the U.S. Forest Service, Bureau of Land Management, and the U.S. Army Corps of Engineers, a programmatic environmental assessment for the establishment of Oregon chub populations within the Willamette River basin. This document will streamline the process of reintroducing the species into suitable habitats within its historic range. Private landowners will be encouraged to participate in reintroduction efforts.

In August 1996, a no-spray agreement with Oregon Department of Transportation was formalized to protect Oregon chub sites located in the Middle Fork Willamette River drainage adjacent to Highway 58 in Lane County. The agreement prohibits spraying of herbicides in the vicinity of Oregon chub sites and limits vegetation control to mechanical methods if necessary.

In January 1997, a Memorandum of Understanding (MOU) was signed by us and the City of Salem to protect Oregon chub at the Geren Island Water Treatment Facility in the North Santiam River. The MOU sets interim restrictions on facility operations that might affect Oregon chub on the site until a formal Habitat Conservation Plan is developed.

In February 1997, a draft Habitat Conservation Plan (HCP) was prepared by consultants for the City of Salem to protect and enhance the population of Oregon chub located in the drinking water treatment facility at Geren Island in the North Santiam River. The HCP covers normal operations as well as the proposed expansion of the facility and will provide protected habitat for the Oregon chub for the life of the facility. The HCP is expected to be completed in the fall of 1998.

Section 7 consultation by us on actions authorized, funded or carried out by Federal agencies has occurred on several occasions since the 1993 listing. The

purpose of the consultations was to determine potential impacts of various actions on Oregon chub and to reduce or eliminate the impacts. In 1994, the impacts of the Northwest Pipeline expansion of a natural gas pipeline was evaluated. The proposed pipeline crossed several low gradient streams. The presence or absence of Oregon chub near these stream crossings was determined. Alternative stream crossings that reduced the impact were recommended and implemented for the two locations where Oregon chub were found (Dry Muddy Creek and Camas Swale).

In August 1996, we concluded consultation with the U.S. Army Corps of Engineers (Corps) on the impact of continued operation of the Willamette Basin Hydropower System on Oregon chub. At the time, known populations of Oregon chub existed downstream or within project boundaries of 8 of the 13 Corps projects within the basin. Each project was evaluated relative to its potential influence on Oregon chub populations. Projects determined to have moderate potential to influence populations of the species included Foster, Green Peter, Big Cliff, and Detroit Reservoirs in the Santiam River. Dexter, Lookout Point, Fall Creek, and Hills Creek Reservoirs in the Middle Fork Willamette River Basin were determined to have a high potential for influencing Oregon chub populations. Since Oregon chub continue to persist under the influence of these projects, and the available information base at the time of consultation was insufficient to allow us to propose modifications to Corps operations that would benefit Oregon chub, we requested that the Corps fund additional studies to help determine the role and impact of reservoir operation on survival of Oregon chub. We also requested advance notification prior to any operational changes outside the range of operation experienced to date.

Additional conservation measures that were implemented to improve the status of Oregon chub include reintroductions of Oregon chub within the historical range, habitat enhancement projects, and public education. Oregon chub have been translocated to three locations in the Middle Fork Willamette River sub-basin:

1. Oregon chub were introduced into Wicopee Pond on the Willamette National Forest in 1988, prior to the listing. Wicopee Pond was formed

when a bridge crossing was constructed on a small logging road that crosses Salt Creek. Fifty Oregon chub were transferred from Shady Dell Pond to this site. The site has been sampled in 1992, 1993, 1995, and 1996. Very few Oregon chub (0 to 9) have been collected in any year, despite substantial sampling efforts (Scheerer *et al.* 1992, 1993, 1995, 1996, Scheerer and Jones 1997).

2. Oregon chub were introduced into Ferrin Ponds on the Willamette National Forest in 1994. The water levels in the constructed ponds were lowered as much as possible in the fall of 1993 and the remaining water was treated with rotenone to poison the non-native fish. In April 1994, 525 Oregon chub were captured in East Fork Minnow Creek Pond and released into West Ferrin Pond. In September 1994, it was determined that the rotenone treatment was ineffective in West Ferrin Pond when non-native western mosquitofish, both young of the year and fecund adult females were collected (Scheerer *et al.* 1995). Chemical treatments have also been found to be ineffective in the removal of western mosquitofish from the habitat of the rare Sonoran topminnow (*Poeciliopsis occidentalis*) in Arizona (Meffe 1983, 1984). No Oregon chub were collected from West Ferrin Pond in September 1995, 1996 or 1997. In May 1994, biologists thoroughly snorkeled and seined in East Ferrin Pond and neither collected nor observed any fish. In September 1994, 573 Oregon chub were released into East Ferrin Pond. In September 1995, the population of Oregon chub in East Ferrin Pond was estimated to be 3,500 fish. Non-native western mosquitofish were also extremely abundant. In September 1997, the population of Oregon chub had expanded to 7,200 fish. The population of western mosquitofish was estimated at 88,000 fish (Scheerer *et al.* 1998).
3. In September 1996, Oregon chub were introduced into the Fall Creek Spillway Pond, located in the overflow channel below Fall Creek Dam, on land managed by the U.S. Army Corps of Engineers. A total of 500 Oregon chub were used to establish this new population; 150 fish were transferred from Shady Dell Pond, and 350 were taken from East Fork Minnow Creek Pond. In Fall 1997, the population was estimated at 480

Oregon chub, including young of the year fish (Scheerer *et al.* 1998). The recipient pond was formed by a beaver dam that blocks the spillway overflow channel and has been in existence for approximately 10 years. The site has high quality Oregon chub habitat (i.e., depositional substrate, abundant aquatic vegetation, no non-native fishes present, shallow depth, suitable summer temperatures) and contains native speckled dace (*Rhynchithys osculus*) and western pond turtles (*Clemmys marmorata*). Bullfrogs were found in the pond prior to the reintroduction; a removal effort was attempted with little success. Further efforts will be taken to remove bullfrogs, if feasible. This action should benefit both the western pond turtles and Oregon chub and provide information regarding bullfrog diet preferences.

In 1994, the Hospital Impoundment Pond habitat enhancement project was excavated in Lookout Point Reservoir in the Middle Fork Willamette River drainage. The pond was designed to benefit western pond turtles and Oregon chub; the project was funded by the U.S. Army Corps of Engineers and the U.S. Forest Service. The pond uses the former railroad grade in the drawdown zone of the reservoir west of Hospital Creek. The outflow from Hospital Pond was diverted into the new pond. The pond is not isolated from the reservoir and is flooded when the reservoir is at full pool. The expectation was that the Oregon chub exiting through the culvert from Hospital Pond (a site that contains an estimated 3,030 Oregon chub) would use this pond, rather than drop into the reservoir during low pool. In 1995, Oregon chub were collected in the small pool below the outflow culvert from Hospital Pond but no Oregon chub were detected in the new pond. In 1995, juvenile crappies were present in the new pond. In September 1996, native sculpins (*Cottus* sp.) were collected in the excavated pond and a juvenile chinook salmon (*Oncorhynchus tshawytscha*) was found in the pool downstream of the culvert. No Oregon chub were collected in 1996, 1997 or 1998, and non-native fish were collected in 1995, 1997 and 1998. These findings suggest that this pond may not sustain a population of Oregon chub and that it attracts and traps other fish that live in the reservoir.

In the Mainstem Willamette River Sub-basin, a population of Oregon chub was introduced in 1997 into habitat at Dunn Wetland. A habitat enhancement

project was initiated in 1995 on private land in the Beaver Creek drainage in Benton County. The site is the location of a 12-hectare (30-acre) wetland rehabilitation project initiated in 1992 to benefit migratory waterfowl. The enhancement work for Oregon chub involved the creation of a 1-hectare (2-acre) pond and increasing the depth of several existing ponds in the wetland to prevent desiccation during the summer. Excavation was completed in 1997 and Oregon chub were introduced into the original pond.

In the Mainstem Willamette River sub-basin, we have also initiated habitat enhancement work at several sites in the Gray Creek drainage at William L. Finley National Wildlife Refuge. Display Pond has been identified as a potential reintroduction site. This pond is located on Hull Creek, a tributary of Gray Creek. In the summer of 1996, Display Pond was drained to remove non-native fish (bullhead and mosquitofish). Restoration of Cattail Pond was initiated in 1997 to repair the damaged dike and improve habitat for Oregon chub. Currently, Cattail Pond does not maintain year-round water during drought years. Restoration will include raising the height of the dike, replacement of the water control structure with structures that inhibit upstream movement of non-native fishes, and re-contouring to deepen and enlarge the pond. Pond restoration is scheduled for completion in 1998. Similar modifications are planned for Beaver Pond. A population estimated at 520 Oregon chub is located in the upper Gray Creek drainage at Gray Creek Swamp. This population is expected to colonize the newly restored habitats of Beaver and Cattail Ponds downstream in the middle Gray Creek drainage.

In 1998, we initiated wetland restoration in the South/Dunlin/Wood Duck Pond area of Ankeny National Wildlife Refuge. This area has been identified as a potential Oregon chub introduction site and we are working with the Oregon Department of Fish and Wildlife on wetland design and management.

Preliminary discussions have been initiated with private landowners in the North Santiam River drainage to protect Oregon chub habitat in Gray Slough and to create new habitats for Oregon chub near Gray Slough.

## **G. Recovery Strategy**

### **1. Population Management**

The recovery effort for the Oregon chub will focus on protecting, restoring and enhancing populations on public lands within three sub-basins (Mainstem Willamette River, Middle Fork Willamette River, and Santiam River) in the Willamette River drainage. Although recovery efforts on private lands will not be categorically excluded, this plan will emphasize recovery actions on public lands because of the greater likelihood of stable long-term management on publicly managed lands. Within each of the three sub-basins, at least four stable, protected populations will be managed. Each sub-basin will be treated as a metapopulation. Reintroductions in each sub-basin will be conducted using stock from within the same sub-basin, unless there is no suitably large source population, in which case taking fish from another sub-basin may be necessary. All populations will be monitored and adaptively managed to achieve long term persistence. Although a single small population of Oregon chub currently occurs in a fourth sub-basin, the Coast Fork, recovery efforts will not focus on this sub-basin because surveys have not revealed any other suitable or restorable habitats, and non-native fish are very common.

The first priority of the recovery program for the Oregon chub will be to maintain existing populations of the species. Twenty-four Oregon chub populations are currently known -- this includes natural and reintroduced populations. Existing sites have been given a “management priority number” (see Table 1). Sites with a management priority of 1 are large populations in high quality natural habitats; priority 2 sites have relatively natural habitat conditions but low population numbers; priority 3 sites are highly altered, have low population numbers and/or are difficult to manage.

Next in importance, after protecting existing populations, will be the establishment of new populations through reintroductions or habitat enhancement to facilitate natural colonization in each of the three sub-basins. Several candidate sites have been identified (Table 2). Potential reintroduction sites will be favored if they meet the following criteria: 1) few or no non-native fish or bullfrogs are

**Table 2. Potential Oregon Chub Reintroduction Sites**

(All sites require further evaluation before reintroductions can be conducted)

<b>SITE</b>	<b>LANDOWNER</b>	<b>HABITAT MODIFICATION NEEDED?</b>	<b>OTHER SENSITIVE SPECIES PRESENT</b>	<b>REINTRODUCTION PRIORITY<sup>1</sup></b>
<b>SANTIAM RIVER SUB-BASIN</b>				
Foster Pullout Pond	US Army Corps of Engineers	No	Red-legged frog, pond turtle	1
Foster Quarry Pond	US Army Corps of Engineers	No		1
Gray Property 2	Private	Yes	Red-legged frog, pond turtle	2
<b>MAINSTEM WILLAMETTE RIVER SUB-BASIN</b>				
William L. Finley NWR - Beaver/Cattail Ponds	US Fish and Wildlife Service	Yes	Red-legged frog	2
William L. Finley NWR - Display Pond	US Fish and Wildlife Service	No		1
William L. Finley NWR - Brown Creek	US Fish and Wildlife Service	No	Pond turtle	1
Ankeny NWR - Wood Duck/Dunlin/South Pond Wetland	US Fish and Wildlife Service	Yes		2

**Table 2. (cont.)**

SITE	LANDOWNER	HABITAT MODIFICATION NEEDED?	OTHER SENSITIVE SPECIES PRESENT	REINTRODUCTION PRIORITY <sup>1</sup>
<b>MIDDLE FORK WILLAMETTE RIVER SUB-BASIN</b>				
Fall Creek Pond	US Army Corps of Engineers	Yes		2

<sup>1</sup> Reintroduction Priority:

1 = current conditions are suitable for reintroduction;

2 = significant habitat enhancement is required before reintroduction can be pursued.

present; 2) there is a low likelihood of colonization by non-native predators or competitors; 3) adjacent land is natural habitat; 4) the site has existing high quality Oregon chub habitat; 5) there is a low probability of other threats to habitat quality (e.g., chemical spills, sedimentation from logging operations); and 6) the site is publicly owned. Additional sites will be identified through future surveys. Sites identified in Table 2 have been assigned a “reintroduction priority” of 1 or 2. Priority 1 sites are those at which current conditions are suitable for reintroduction; priority 2 sites are those at which significant habitat enhancement is required before reintroduction can be pursued.

The 1992 Interagency Conservation Agreement specified guidelines for reintroducing Oregon chub into their historic range. These are adapted from Williams *et al.* (1988), and are consistent with Oregon Department of Fish and Wildlife policy and responsibility for finfish introductions (Oregon Department of Fish and Wildlife 1982).

#### Reintroduction Guidelines:

- (A) Factors to consider when selecting introduction sites:
1. Restrict introductions to sites within the historic distribution.
  2. Restrict introductions to protected sites which are secure from imminent or future threats of habitat destruction.
  3. Restrict introductions to sites where the potential for dispersal has been determined and is acceptable.
  4. Restrict introductions to sites that are likely to fulfill life history requirements. Features include: less than 1,000 meters (3,000 feet) elevation, depositional substrate, gradually sloping banks, varied aquatic vegetation, little or no water velocity, mostly less than 2 meters (6 feet) deep, limited use or access by the public, no non-native fish species, and summer water temperature exceeding 16 degrees Celsius (61 degrees Fahrenheit). Site manipulations to comply with this guideline are permissible. Introductions and site manipulations will be coordinated with landowners of proposed sites. Develop a post-introduction site management plan prior to introduction and coordinate with landowner and/or managing agencies.

5. Restrict introductions to sites that contain sufficient habitat to support a genetically viable population.
  6. Prohibit introductions into areas where other rare or endemic taxa could be adversely affected.
- (B) Steps to follow when conducting introductions:
1. Obtain introduction stock of a sufficient number and character. If the source population is not threatened by imminent loss, up to 10 percent of the population may be removed annually.
  2. If disease in the source or target environment is a concern, consult an Oregon Department of Fish and Wildlife pathologist regarding the presence of undesirable pathogens.
  3. Introduce stock under the most favorable weather and hydrologic conditions. Avoid transfers during the spawning season.
  4. Document the date, the number stocked, the source and receiving waters, and the persons conducting the introduction.
- (C) Activities to be completed post-introduction:
1. Conduct systematic monitoring of the introduced populations.
  2. Determine the cause of unsuccessful introductions.
  3. Restock the site if it is warranted.
  4. Document the findings and conclusions.

Recovery actions for the Oregon chub are expected to benefit other native aquatic species in the Willamette Valley. The northern red-legged frog (*Rana aurora aurora*) and the western pond turtle, both species of concern to us, inhabit similar habitats and may respond positively to habitat management for the Oregon chub.

## **2. Research**

Research into several aspects of Oregon chub ecology is needed to design and implement effective management strategies for the species. The studies recommended in this plan will provide better information on the attributes of suitable habitats, spawning cues, survival rates, and effects of non-native

predators and competitors.

### **3. Outreach**

A public education and outreach strategy is needed to ensure the safety of Oregon chub populations. Many of the existing and potential recovery sites will have some public access, which poses a threat of unauthorized game fish introductions. A public education campaign may reduce this risk, and may also generate support for the concept of native fish management in the region.

## **PART II. RECOVERY**

### **A. Objectives**

The ultimate objective of this recovery plan is to delist the Oregon chub by establishing a sufficient number of secure, managed populations distributed throughout the Willamette Valley. Delisting will be challenging because the extensive alteration of the natural hydrologic regime of the Willamette River has eliminated the processes which created and maintained suitable Oregon chub habitat. Hydrologic alteration of the river system has also reduced the seasonal flood frequency of the river, acting to disassociate the river from its natural floodplain, thus isolating existing Oregon chub populations. Frequent seasonal floods were likely the primary mechanism for Oregon chub dispersal into new and existing habitats; the elimination of these flow conditions has removed the natural mechanism that allowed interchange between isolated Oregon chub populations. The pervasive presence of non-native fish predators and competitors also renders many otherwise suitable habitats off-limits to Oregon chub.

Planned reintroductions of the species will be necessary to maintain weaker populations, and to expand the currently restricted range of the Oregon chub. Restoration and enhancement of natural habitats (e.g., beaver ponds, sloughs, and restored floodplains) should be favored over creation of isolated, artificial ponds. Population monitoring and reintroductions will be required over the long term to ensure persistence and recovery of the species. Delisting will only be considered when at least 20 large, stable or increasing populations have been established with permanent management in place.

**Objective 1:** Prevent extinction

Criterion: Maintain currently occupied sites.

**Objective 2:** Downlist to threatened

Criteria: Establish and manage 10 populations of at least 500 adults each; all of these populations must exhibit a stable or increasing trend for 5 years. At least three populations must be located in each of the three sub-basins (Mainstem

Willamette, Middle Fork Willamette and Santiam).

**Objective 3.** Delist

Criteria: Establish and manage 20 populations of at least 500 adults each; all of these populations must exhibit a stable or increasing trend for 7 years. At least four populations must be located in each of the three sub-basins (Mainstem Willamette, Middle Fork Willamette and Santiam). Management of these populations must be guaranteed in perpetuity.

**B. Step-down Narrative Outline for Recovery Actions**

**1. Manage the existing sites.**

Current known or suspected threats to existing populations of Oregon chub are shown in Table 3. Populations of Oregon chub should be monitored and adaptively managed to ameliorate these threats. In general, removal of threats and enhancement activities at occupied sites will take the following forms:

- o Prevent or minimize biotic threats by preventing introduction of non-native fish and amphibians that may act as predators or competitors, removing non-native species (if practical), and isolating Oregon chub populations from introduced fish pathogens.
- o Enhance conditions and maintain optimal physical parameters of Oregon chub habitats by preventing inappropriate water diversions, fill or removal of material, water temperature change, excessive sedimentation or removal of cover.
- o Prevent chemical impacts by prohibiting use of pesticides and herbicides and reducing the risk of accidental spills of toxicants near Oregon chub populations.
- o Identify suitable stream reaches within each sub-basin and, where possible,

**Table 3. Current Known or Suspected Threats at Existing Oregon Chub Recovery Sites**

<b>SITE</b>	<b>THREATS<sup>1</sup></b>
<b>SANTIAM RIVER SUB-BASIN</b>	
Geren Island	1,2,3,4,5
Santiam Conservation Easement Sloughs	1,2,3,4,6
Greens Bridge Backwater	1,2,3,4
Santiam I-5 Backwater	1,2,3,4
Pioneer Park Backwater	2,4
Gray Slough	4,7
<b>MAINSTEM WILLAMETTE RIVER SUB-BASIN</b>	
William L. Finley National Wildlife Refuge - Gray Swamp	1,2,3,5,6,7
Camous Creek	1,2,3,4,6
Dry Muddy Creek	2,3,4,6
Dunn Wetland	3,4
<b>COAST FORK WILLAMETTE RIVER SUB-BASIN</b>	
Camas Swale	1,2,3,4,6
<b>MIDDLE FORK WILLAMETTE RIVER SUB-BASIN</b>	
East Fork Minnow Creek Pond	5,6
Shady Dell Pond	2,6
Elijah Bristow State Park	2
Hospital Pond	2,6
Dexter Reservoir Alcoves	1,2,3,5,6
Rattlesnake Creek	1,2,3,4
Oakridge Slough	6

SITE	THREATS <sup>1</sup>
Jasper Park Slough	1,2,3,7
Buckhead Creek	6
East Ferrin Pond	1,2,3
Wicopee Pond	5
Fall Creek Spillway Pond	2,3,8
Wallace Slough	1,2,6

<sup>1</sup> Threats:

- 1 = non-native fish present
- 2 = threat of non-native fish introduction
- 3 = bullfrogs present
- 4 = possible agricultural chemical runoff
- 5 = possible logging / siltation in watershed
- 6 = other water quality issues, including threat of spills
- 7 = low summer water levels
- 8 = spillway operation

restore floodplain habitats within the natural dispersal range of existing Oregon chub populations. This should result in increased abundance of populations limited by lack of suitable habitat.

***Santiam River Sub-basin***

**1.1 Geren Island**

**1.1.1 Protect Oregon chub habitat through an agreement with the City of Salem.**

Set aside the North Pond and North Channel as habitat for Oregon chub. Protect and manage these sites in perpetuity.

**1.1.2 Reduce the threat of logging-related sedimentation.**

Pursue agreements with the U.S. Forest Service and

commercial timber companies in the watershed to reduce the risk of degraded water quality resulting from logging-induced sedimentation.

## **1.2 Santiam Conservation Easement**

### **1.2.1 Create a buffer zone.**

Secure adjacent uplands to buffer Oregon chub habitats from agricultural runoff.

### **1.2.2 Control fertilizer/pesticide/herbicide inputs.**

Monitor water quality for fertilizer, pesticide and herbicide contamination. Maintain or expand herbicide/pesticide spray restrictions.

## **1.3 Greens Bridge Backwater**

### **1.3.1 Create a buffer zone.**

Develop and enhance buffer zones of native vegetation between Oregon chub habitat and adjacent agricultural land.

## **1.4 Santiam I-5 Backwater**

### **1.4.1 Create a buffer zone.**

Develop and enhance buffer zones of native vegetation between Oregon chub habitat and agricultural land upstream.

### **1.4.2 Create or enhance the adjacent habitat.**

Expand habitat currently available to Oregon chub by creating or enhancing adjacent areas within dispersal range of the existing population. This may include opening up a connection to the Santiam River or excavating new ponds.

## **1.5 Pioneer Park Backwater**

### **1.5.1 Create a buffer zone.**

Develop and enhance buffer zones of native vegetation

between Oregon chub habitat and nearby agricultural land.

## **1.6 Gray Slough**

### **1.6.1 Enlarge and enhance the habitat area.**

Restore and enhance additional habitat for Oregon chub in and adjacent to the slough.

### **1.6.2 Control the water levels.**

Evaluate methods for improving water levels in chub habitat. Construct a water control structure to maintain suitable water levels in the summer. This could be accomplished by opening up the connection to the North Santiam River channel.

## ***Mainstem Willamette River Sub-basin***

## **1.7 William L. Finley National Wildlife Refuge - Gray Swamp**

### **1.7.1 Manage habitats on the Refuge.**

Restore, enhance and secure wetland habitats on the Refuge to which Oregon chub can naturally disperse or be transplanted. Establishing new sub-populations on the Refuge will reduce the risk that a single, catastrophic event could cause the local extinction of the species.

### **1.7.2 Construct barriers.**

As appropriate and necessary, establish barriers to prevent further invasion by non-native fish.

### **1.7.3 Protect and/or acquire land in the watershed.**

Protect the wetland habitats of Gray Creek from the adverse effects of logging operations through land acquisition or conservation easements of forest lands in the Gray Creek drainage.

**1.7.4 Control herbicide/pesticide inputs.**

Develop and maintain herbicide/pesticide spray restrictions.

**1.8 Camous Creek**

**1.8.1 Create a buffer zone.**

Acquire or negotiate conservation easements on adjacent uplands to buffer Oregon chub habitats from agricultural runoff.

**1.8.2 Enhance habitat in the creek.**

Restore and enhance habitat in the creek to provide additional habitat for chub.

**1.8.3 Control herbicide/pesticide inputs.**

Pursue agreements for herbicide/pesticide spray restrictions.

**1.9 Dry Muddy Creek**

**1.9.1 Create a buffer zone.**

Acquire or negotiate conservation easements on adjacent uplands to buffer Oregon chub habitats from agricultural runoff.

**1.9.2 Enhance habitat in the creek.**

Restore and enhance habitat in the creek to provide additional habitat for chub.

**1.9.3 Control herbicide/pesticide inputs.**

Pursue agreements for herbicide/pesticide spray restrictions on adjacent properties.

**1.10 Dunn Wetland**

**1.10.1 Control bullfrogs.**

Attempt to remove bullfrogs in the wetland.

**1.10.2 Manage a buffer zone.**

Maintain and manage a buffer of native vegetation between adjacent agricultural lands and Oregon chub habitats.

***Coast Fork Willamette River Sub-basin***

**1.11 Camas Swale**

**1.11.1 Create a buffer zone.**

Acquire or negotiate conservation easements on adjacent uplands to buffer Oregon chub habitats from agricultural runoff.

**1.11.2 Enhance habitat in the creek.**

Restore and enhance habitat in the creek to provide additional habitat for chub.

**1.11.3 Control herbicide/pesticide inputs.**

Monitor water quality and take action to improve conditions if warranted by pursuing agreements for herbicide/pesticide spray restrictions on adjacent properties.

***Middle Fork Willamette River Sub-basin***

**1.12 East Fork Minnow Pond**

**1.12.1 Reduce the risk of logging-related sedimentation.**

Pursue agreements with the Oregon Department of Forestry and commercial timber companies in the watershed to reduce the risk of degraded water quality resulting from logging-induced sedimentation.

**1.12.2 Control herbicide/pesticide inputs.**

Maintain agreements for herbicide/pesticide spray restrictions on adjacent properties.

**1.12.3 Evaluate runoff barriers.**

Construct barriers between chub habitats and adjacent Highway 58 to direct runoff and possible contaminant spills away from the Oregon chub population.

**1.12.4 Monitor the effects of public access.**

If necessary, take action to reduce impacts, limit access, close the area to angling, or post signs regarding the illegality/fines for transportation and introduction of fish from one location to another.

**1.12.5 Protect resident beaver which maintain the dam.**

Protect the resident beaver population which maintains the dam and water levels in the pond. This may be partly accomplished by Oregon Department of Transportation signage.

**1.13 Shady Dell Pond**

**1.13.1 Control herbicide/pesticide inputs from National Forest lands.**

Pursue an agreement with the U.S. Forest Service for herbicide/pesticide spray restrictions around chub habitat.

**1.13.2 Maintain herbicide/pesticide restrictions established with the Oregon Department of Transportation (ODOT).**

Maintain herbicide/pesticide spray restrictions on adjacent ODOT rights-of-way.

**1.13.3 Monitor the effects of public access from the adjacent campground and take action to reduce the impacts.**

If necessary, take action to reduce impacts, limit access, close the area to angling, or post signs regarding the illegality/fines for transportation and introduction of fish from one location to another.

**1.13.4 Evaluate and build a runoff barrier.**

Work with ODOT to install a highway curb, if appropriate and feasible, to direct road runoff away from the pond.

**1.13.5 Evaluate and build a guard rail.**

Work with ODOT to install a guard rail, if appropriate and feasible, to reduce the likelihood of vehicle accidents disturbing the pond.

**1.14 Elijah Bristow State Park**

**1.14.1 Build a fish barrier or water control structure.**

Establish a barrier to protect Oregon chub habitat from invasion by non-native fish and to maintain water levels. This may be accomplished by protecting the local beaver population to ensure that the beaver dam remains intact.

**1.14.2 Monitor the effects of public access in the sloughs with Oregon chub.**

If necessary, take action to reduce impacts, limit access, close the area to angling, or post signs regarding the illegality/fines for transportation and introduction of fish from one location to another.

**1.14.3 Create and maintain a vegetation barrier around chub habitat.**

Establish a barrier of native vegetation around Oregon chub habitat to discourage public access into the ponds and sloughs.

**1.14.4 Control herbicide/pesticide application near chub habitat.**

Create a no-spray buffer around Oregon chub habitat to protect water quality.

**1.14.5 Consider outreach and signage.**

Evaluate and implement appropriate forms of outreach to educate visitors about Oregon chub at the State Park.

**1.15 Hospital Pond**

**1.15.1 Improve the fish barrier.**

Enhance the existing rock barrier below the culvert to prevent invasion by non-native fish from Lookout Point Reservoir.

**1.15.2 Build runoff barriers.**

Evaluate and install barriers between adjacent roads to direct runoff away from the pond.

**1.15.3 Monitor the effects of public access.**

If necessary, take action to reduce impacts, limit access, close the area to angling, or post signs regarding the illegality/fines for transportation and introduction of fish from one location to another.

**1.16 Dexter Reservoir Alcoves**

**1.16.1 Build fish barriers.**

Establish barriers between Oregon chub habitat and the Dexter Reservoir to prevent further invasion by non-native fish.

**1.16.2 Control herbicide/pesticide inputs.**

Maintain agreements for herbicide/pesticide spray restrictions on adjacent land.

**1.16.3 Build runoff barriers.**

Evaluate and construct barriers, if appropriate and feasible, between chub habitat and adjacent Highway 58 to direct runoff and possible contaminant spills away from the Oregon chub habitat.

**1.16.4 Manage water levels.**

Investigate the construction of a standpipe or water control structure to prevent the daily drawdown and dewatering of vegetated Oregon chub habitat in the Alcoves.

**1.16.5 Reduce the threat of logging-related sedimentation.**

Pursue agreements with adjacent landowners in the watershed to reduce the risk of degraded water quality resulting from logging-induced sedimentation.

**1.16.6 Monitor the effects of public access.**

If necessary, take action to reduce impacts, limit access, close the area to angling, or post signs regarding the illegality/fines for transportation and introduction of fish from one location to another.

**1.17 Rattlesnake Creek**

**1.17.1 Create a buffer zone.**

Acquire or negotiate conservation easements on adjacent uplands to buffer Oregon chub habitat from agricultural runoff.

**1.17.2 Enhance habitat in the creek.**

Restore and enhance habitat in the creek to provide additional habitat for chub.

**1.17.3 Control herbicide/pesticide inputs.**

Pursue agreements for herbicide/pesticide spray restrictions on adjacent properties.

**1.18 Oakridge Slough**

**1.18.1 Monitor the effects of the adjacent sewage treatment plant practices on water quality in Oregon chub habitat.**

If nutrient rich runoff entering the slough is degrading

water quality for the chub, take actions to reduce the impacts.

## **1.19 Jasper Park Slough**

### **1.19.1 Manage the water level.**

Construct a water control structure to maintain adequate water levels in the slough. Evaluate the possibility of establishing a connection to the river to maintain water levels.

### **1.19.2 Monitor the effects of public access.**

If necessary, take action to reduce impacts, limit access, close the area to angling, or post signs regarding the illegality/fines for transportation and introduction of fish from one location to another.

## **1.20 Buckhead Creek**

### **1.20.1 Maintain a native vegetation buffer.**

Maintenance of rights-of-way by the Bonneville Power Administration and Southern Pacific Railroad removes riparian vegetation adjacent to the creek. Negotiate a riparian management agreement with these entities to preserve a buffer of native vegetation surrounding the chub habitat.

### **1.20.2 Control herbicide/pesticide inputs.**

Right-of-way maintenance also has the potential to introduce herbicides into the creek. Negotiate no-spray agreements with the Bonneville Power Administration and Southern Pacific Railroad to protect water quality in the chub habitat.

### **1.20.3 Create new habitat.**

Increase the habitat area by constructing additional ponds for Oregon chub adjacent to and connected with Buckhead

Creek.

**1.21 East Ferrin Pond**

**1.21.1 Maintain fish barriers.**

Maintain the existing barriers to prevent further invasion by non-native fish.

**1.21.2 Manage the water level.**

Maintain the recently constructed water control structure to assure adequate water levels in the pond.

**1.22 Wicopee Pond**

**1.22.1 Maintain water levels.**

Establish a water control structure separate from the existing culvert to ensure adequate water levels in the pond. Educate the maintenance crews about the importance of protecting the pond for Oregon chub.

**1.23 Fall Creek Spillway Pond**

**1.23.1 Reduce the threat of non-native fish introductions.**

Establish fish barriers, limit public access and post signs to prevent introduction of non-native fish.

**1.23.2 Control bullfrogs.**

If bullfrogs are believed to be a problem, attempt to remove them from Oregon chub habitat.

**1.24 Wallace Slough**

**1.24.1 Control herbicide/pesticide inputs.**

Pursue agreements for herbicide/pesticide spray restrictions on adjacent properties.

**2. Establish new populations.**

The establishment of new populations in each of the three sub-basins will be essential to the recovery of the Oregon chub. By increasing the number

and size of populations, beyond those currently existing, we can reduce the probability that a single environmental catastrophe could simultaneously affect all populations of the species. Thus, the risk of extinction will be reduced.

**2.1 Seek new introduction sites or expand the habitat available to existing populations.**

Continue to survey habitats in the three sub-basins to identify potential reintroduction sites. Preference should be given to sites with natural hydrology (e.g., sloughs, beaver ponds) and a diversity of other native species present. Where possible, populations should be allowed to expand through dispersal into restored habitats within the same system.

**2.2 Develop and rank a list of sites for reintroductions.**

Table 2 presents a preliminary list of sites that may be suitable. Evaluate potential sites based on criteria described under “Reintroduction Guidelines” in the Population Management section of the Recovery Strategy. More information, and in some cases, extensive site preparation, will be required before introductions may proceed.

**2.3 Plan reintroductions as warranted.**

Plan reintroductions based on criteria outlined in the Recovery Strategy section (above) and Appendix 1. Reintroduction stock should be taken from within the sub-basin which contains the new site. Successive introductions within a sub-basin should come from a variety of source populations to ensure a diverse genetic makeup to the metapopulation within a sub-basin.

**2.4 Monitor and manage the reintroduced populations.**

Monitor the success of reintroduction efforts, and take actions necessary to improve the status of new populations. Populations should be adaptively managed to gain a better understanding of the interactions between the Oregon chub and various components of

its environment.

**3. Research.**

Research into several aspects of Oregon chub ecology is needed to design and implement effective management of the species. The research tasks recommended in this plan will fill gaps in our understanding of basic ecological requirements of the Oregon chub, elucidate the effects of non-native competitors and predators on Oregon chub survival and reproduction, and provide guidance on the feasibility of controlling non-native competitors and predators.

**3.1 Determine the timing of spawning, timing of emergence, and patterns of natural mortality.**

Monitor spawning activity and juvenile (age 0) Oregon chub abundance at selected field sites and in the laboratory to determine the timing of spawning, timing of emergence, and patterns of natural mortality. Relate these factors with water temperatures, photoperiod, and other environmental variables. This work is ongoing and has been funded by the Corps of Engineers through ODFW.

**3.2 Validate the age structure of selected Oregon chub populations and determine length-at-age relationships.**

This work will enable biologists to determine the relative contribution of each year class to the total population, and to approximate the survival rates for each year class by studying their numbers in successive years.

**3.3 Monitor temperature profiles, water chemistry, composition of aquatic vegetation, and macroinvertebrate diversity.**

At regular intervals, monitor temperature profiles, water chemistry, composition of aquatic vegetation, and macroinvertebrate diversity across the range of Oregon chub locations. These measurements will be used to better characterize existing sites, to infer relationships with Oregon chub abundance, and to choose

reintroduction sites.

**3.4 Estimate population abundance of Oregon chub at selected sites, including reintroduction sites.**

Monitor and evaluate the natural fluctuations in Oregon chub abundance at existing sites and monitor the rates of expansion at reintroduction sites

**3.5 Determine the diet of bullfrogs at Oregon chub sites.**

Bullfrogs exist, often in high numbers, at several Oregon chub sites and many potential Oregon chub reintroduction sites. Bullfrog predation has been implicated as a major factor in the decline of native western pond turtles and red-legged frogs. The diet of bullfrogs will be determined by gut analysis of captured bullfrogs. These data will assist managers in determining the impact of bullfrogs on Oregon chub populations.

**3.6 Determine the effect of interactions between Oregon chub and mosquitofish.**

Non-native mosquitofish occur at several Oregon chub population sites. Information on the interactions between the two species will be useful in making habitat management decisions. If the effect of mosquitofish is clearly negative, removal efforts may be warranted.

**3.7 Investigate the feasibility of methods for eliminating or excluding non-native fish and amphibians from Oregon chub habitats.**

Non-native fish and amphibians are believed to have contributed to the decline of the Oregon chub through predation and competition for limited food resources. At present, there is no economically feasible method for removal of non-native species from habitats managed for Oregon chub. Research into technologically and economically feasible methods of non-native species control is needed.

#### **4. Public Education and Outreach**

The success of the recovery effort for the Oregon chub will depend on the interest and support of the public. To this end, fostering a greater understanding of the Oregon chub, its status, the factors that influence its populations, and its role in the natural environment of the Willamette Valley is essential.

##### **4.1 Prepare and publish articles in appropriate popular literature.**

Encourage the publication of information regarding recovery efforts by any of the public agencies managing habitat for the Oregon chub. Appropriate platforms for the information would include local newspapers, regional television shows, brochures and press releases.

##### **4.2 Conduct public education.**

Educate the public about efforts to maintain and increase populations of Oregon chub, focusing on the risks of introduced fish and amphibian species.

##### **4.2.1 Select appropriate public sites for interpretive displays.**

Most of the existing Oregon chub populations occur on publicly managed lands. Where appropriate, develop interpretive displays about the species' ecology and status, and the role of the public in the recovery of the Oregon chub.

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## **PART IV. IMPLEMENTATION SCHEDULE**

The Implementation Schedule that follows is a summary of actions and estimated costs for this recovery program. It is a guide to meet the objectives described in Part II of this plan. This schedule indicates the priority in scheduling tasks to meet objectives, identifies agencies responsible for performing each task, and estimates costs to each agency. These actions, when accomplished, will satisfy the recovery objectives. Initiation of these actions is subject to the availability of funds.

Priorities in Column 1 of the following Implementation Schedule are assigned as follows:

- Priority 1 - An action that must be taken to prevent extinction or to prevent the species from declining irreversibly.
- Priority 2 - An action that must be taken to prevent a significant decline in species population or habitat quality, or other significant adverse impact short of extinction.
- Priority 3 - All other actions necessary to provide for full recovery of the species.

Abbreviations used:

USFWS	U.S. Fish and Wildlife Service
USFWS-OSO	Oregon State Office
USFWS-WOR	Western Oregon National Wildlife Refuge Complex
USFS	U.S. Forest Service
ACOE	U.S. Army Corps of Engineers
NRCS	Natural Resource Conservation Service
ODFW	Oregon Department of Fish and Wildlife
OPRD	Oregon Parks and Recreation Department
ODOT	Oregon Department of Transportation
ODF	Oregon Department of Forestry
BPA	Bonneville Power Administration
SPRR	Southern Pacific Railroad
PVT	Private Landowner

### Implementation Schedule - for the Oregon Chub Recovery Plan

Priority #	Task #	Task Description	Task Duration	Responsible Party	Total Cost in \$1,000	Cost Estimate (\$1,000)				Comments
						1998	1999	2000	2001	
1	1.1.1	Develop agreement with the City of Salem to protect chub habitat	1	USFWS - OSO City of Salem	5 20	5 20				
2	1.1.2	Pursue agreements with USFS and private logging companies to reduce water quality impacts from logging to Geren Island	1	USFWS - OSO USFS	2 2		2 2			Coordinate with PVT
2	1.2.1	Acquire buffer zone habitat around Santiam Conservation Easement	4	USFWS - WOR	200		50	50	50	
2	1.2.2	Control pesticide/herbicide inputs from land adjacent to Santiam Conservation Easement	1	USFWS - WOR	5		5			
2	1.3.1	Maintain/expand riparian buffer zones around Greens Bridge Backwater	1	ODFW	10				10	Coordinate with PVT
2	1.4.1	Maintain/expand riparian buffer zones around Santiam I-5 Backwater	1	ODOT	10				10	
2	1.4.2	Create or enhance habitat adjacent to existing site	2	ODOT	50		30	20		
2	1.5.1	Maintain/expand riparian buffer zones around Oregon chub habitat at Pioneer Park Backwater	1	USFWS - OSO City of Stayton	10 5				10 5	

Priority #	Task #	Task Description	Task Duration	Responsible Party	Total Cost in \$1,000	Cost Estimate (\$1,000)				Comments
						1998	1999	2000	2001	
2	1.6.1	Enlarge/enhance habitat area at Gray Slough	1	USFWS - OSO	10				10	Coordinate with PVT
2	1.6.2	Construct water control structure to maintain water levels in Oregon chub habitat at Gray Slough	1	USFWS - OSO	30				30	Coordinate with PVT
2	1.7.1	Restore, enhance and secure wetland habitat for transplant populations at Finley NWR	Ongoing	USFWS - WOR	100	20	10	10	10	
2	1.7.2	Construct barriers to non-native fish at Finley NWR	3	USFWS - WOR	75	25	25	25		
2	1.7.3	Acquire land or easements to reduce impacts of logging in the watershed of Finley NWR	3	USFWS - WOR	30		10	10	10	
2	1.7.4	Control herbicide/pesticide application adjacent to Finley NWR	Continuous	USFWS - WOR	5	1	1	1	1	Evaluate effectiveness after 5 years
2	1.8.1	Buffer habitat from agricultural runoff from land adjacent to Camous Creek	1	USFWS - OSO NRCS	15 15		15 15			Coordinate with PVT
2	1.8.2	Enhance habitat in Camous Creek	1	USFWS - OSO ODFW	10 10				10 10	Coordinate with PVT
2	1.8.3	Pursue herbicide/pesticide spray restrictions on adjacent property at Camous Creek	3	USFWS - OSO	3	1	1	1		Coordinate with PVT

Priority #	Task #	Task Description	Task Duration	Responsible Party	Total Cost in \$1,000	Cost Estimate (\$1,000)				Comments
						1998	1999	2000	2001	
2	1.9.1	Create buffer zone around Oregon chub habitat at Dry Muddy Creek	1	USFWS - OSO NRCS	5 5			5 5		Coordinate with PVT
2	1.9.2	Enhance habitat in Dry Muddy Creek	1	USFWS - OSO ODFW	10				10	Coordinate with PVT
2	1.9.3	Pursue herbicide/pesticide spray restrictions on property adjacent to Dry Muddy Creek	2	USFWS - OSO	3	2	1			Coordinate with PVT
2	1.10.1	Control bullfrogs at Dunn Wetland	Continuous	ODFW	15	2	2	2	2	Coordinate with PVT
2	1.10.2	Manage buffer zone around Dunn Wetland	TBD	USFWS - OSO	10		2	2	2	Coordinate with PVT
2	1.11.1	Create buffer zone around Camas Swale	3	USFWS - OSO NRCS	8 2	2 2	3	3		Coordinate with PVT
2	1.11.2	Enhance habitat in Camas Swale	2	USFWS - OSO	10					Coordinate with PVT
2	1.11.3	Pursue herbicide/pesticide spray restrictions on property adjacent to Camas Swale	3	USFWS - OSO	3	1	1	1		Coordinate with PVT
2	1.12.1	Pursue agreements with ODF and private logging companies to reduce water quality impacts from logging on East Fork Minnow Pond	1	USFWS - OSO	3		3			

Priority #	Task #	Task Description	Task Duration	Responsible Party	Total Cost in \$1,000	Cost Estimate (\$1,000)				Comments
						1998	1999	2000	2001	
2	1.12.2	Pursue herbicide/pesticide spray restrictions on property adjacent to East Fork Minnow Pond	3	ODOT	3	1	1	1		
2	1.12.3	Construct barriers between habitat and highway at East Fork Minnow Pond	3	ODOT	20	10	5	5		
2	1.12.4	Monitor effects of public access on Oregon chub at East Fork Minnow Pond	10	ODFW	10	1	1	1	1	
2	1.12.5	Protect the beaver dam which controls water levels at East Fork Minnow Pond	Continuous	ODOT ODFW	10 10	2 2	2 2	2 2	2 2	Annual costs may vary
2	1.13.1	Pursue herbicide/pesticide spray restrictions adjacent National Forest lands	1	USFS	3		3			
2	1.13.2	Maintain herbicide/pesticide spray restrictions negotiated with ODOT	Continuous	ODOT	10	1	1	1	1	
2	1.13.3	Address impacts from campground at Shady Dell Pond	4	USFS	5	2	1	1	1	
2	1.13.4	Coordinate with ODOT to install curb to direct runoff away from pond	1	USFS ODOT	10 10			10 10		
2	1.13.5	Evaluate and build guard rail at Shady Dell Pond	1	USFS ODOT	5 5			5 5		

Priority #	Task #	Task Description	Task Duration	Responsible Party	Total Cost in \$1,000	Cost Estimate (\$1,000)				Comments
						1998	1999	2000	2001	
2	1.14.1	Construct barrier to non-native fish/water control structure at Elijah Bristow State Park	1	OPRD	10			10		
2	1.14.2	Monitor impacts of public use at Elijah Bristow State Park	Continuous	OPRD	10	2	1	1	1	
2	1.14.3	Create and maintain vegetation barrier around chub habitat	Continuous	OPRD	10	2	1	1	1	
2	1.14.4	Control herbicide/pesticide application near chub habitat	1	OPRD	1	1				
2	1.14.5	Outreach and signage at Elijah Bristow State Park	2	OPRD	20	10	10			
2	1.15.1	Maintain and enhance downstream rock barrier at Hospital Pond	Ongoing	ACOE	10	1	1	1	1	
2	1.15.2	Build barriers to direct road runoff away from Hospital Pond	1	ACOE	10	10				
2	1.15.3	Monitor the effects of public access	5	ACOE	10	2	2	2	2	
2	1.16.1	Build fish barrier at Dexter Reservoir Alcoves	Continuous	ACOE	20	1	1	1	1	
2	1.16.2	Pursue herbicide/pesticide spray restrictions on property adjacent to Dexter Reservoir Alcoves	2	ACOE	3		2	1		

Priority #	Task #	Task Description	Task Duration	Responsible Party	Total Cost in \$1,000	Cost Estimate (\$1,000)				Comments
						1998	1999	2000	2001	
2	1.16.3	Construct barriers to control runoff between Oregon chub habitat and highway 58 at Dexter Reservoir Alcoves	1	ACOE	10			10		
2	1.16.4	Maintain water levels in Dexter Reservoir to prevent dewatering in Alcoves	Continuous	USFWS ACOE	2 2	1 1	1 1			Annual costs may vary
2	1.16.5	Pursue agreements with private logging companies to reduce water quality impacts from logging on Dexter Reservoir Alcoves	1	ACOE USFS USFWS - OSO	2 2 2			2 2 2		
2	1.16.6	Monitor effects of public access at Dexter Reservoir Alcoves	Continuous	ACOE	10	1	1	1	1	
2	1.17.1	Create buffer zone around Oregon chub habitat at Rattlesnake Creek	3	USFWS - OSO ODFW	3	1	1	1		Coordinate with PVT
2	1.17.2	Enhance habitat in Rattlesnake Creek	1	ODFW	10			10		Coordinate with PVT
2	1.17.3	Pursue herbicide/pesticide spray restrictions on property adjacent to Rattlesnake Creek	2	USFWS - OSO	3		2	1		Coordinate with PVT
2	1.18.1	Monitor effects of sewage treatment plant on water quality at Oakridge Slough	5	USFS	7	3	1	1	1	

Priority #	Task #	Task Description	Task Duration	Responsible Party	Total Cost in \$1,000	Cost Estimate (\$1,000)				Comments
						1998	1999	2000	2001	
2	1.19.1	Construct water control structure to maintain water levels in Jasper Park Slough	1	ODFW	10				10	Coordinate with PVT
2	1.19.2	Monitor effects of public access at Jasper Park Slough	5	ODFW	5	1	1	1	1	Coordinate with PVT
2	1.20.1	Negotiate riparian management agreement at Buckhead Creek	2	USFS BPA SPRR	2 1 1	1 1 1	1			
2	1.20.2	Negotiate no-spray agreement around Oregon chub habitat at Buckhead Creek	2	USFS BPA SPRR	2 1 1	1 1 1	1			
2	1.20.3	Create new habitat for Oregon chub at Buckhead Creek	3	USFS	12	8	2	2		
2	1.21.1	Maintain barrier to non-native fish at East Ferrin Pond	1	USFS	10		10			
2	1.21.2	Manage water levels at East Ferrin Pond	Continuous	USFS	5	1	1	1	1	Annual costs may vary
2	1.22.1	Maintain water levels in Wicopee Pond	Continuous	USFS	25	15	1	1	1	
2	1.23.1	Reduce threat of introduction by non-native fish at Fall Creek Spillway Pond	Continuous	ACOE	20	1	1	1	1	
2	1.23.2	Control bullfrogs at Fall Creek Spillway Pond	Continuous	ACOE	15	1	1	1	1	Annual costs may vary

Priority #	Task #	Task Description	Task Duration	Responsible Party	Total Cost in \$1,000	Cost Estimate (\$1,000)				Comments
						1998	1999	2000	2001	
3	1.24.1	Pursue herbicide/pesticide spray restrictions on property adjacent to Wallace Slough	1	USFWS - OSO	3			3		Coordinate with PVT
2	2.1	Continue surveys to identify potential reintroduction sites	Continuous	ODFW	100	20	20	20	20	Coordinate with PVT
2	2.2	Develop and rank list of reintroduction sites	3	ODFW USFWS - OSO	15		5	5	5	To be done after task 2.1
2	2.3	Plan and carry out reintroductions	10	ODFW USFWS - OSO	100 100		10 10	10 10	10 10	To be done after task 2.2 is completed
2	2.4	Monitor and manage reintroduced populations	Continuous	ODFW	100	10	10	10	10	
2	3.1	Monitor spawning and juveniles in lab to better understand breeding biology	2	ODFW	20	10	10			
3	3.2	Validate age structure and determine length-at-age relationships	1	ODFW	10		10			
2	3.3	Monitor water quality and composition parameters at population sites	5	ODFW	25	5	5	5	5	
2	3.4	Estimate abundance at existing and reintroduction sites	Continuous	ODFW	100	10	10	10	10	
3	3.5	Determine bullfrog diet at Oregon chub population sites	2	ODFW	10		5	5		

Priority #	Task #	Task Description	Task Duration	Responsible Party	Total Cost in \$1,000	Cost Estimate (\$1,000)				Comments
						1998	1999	2000	2001	
3	3.6	Investigate interactions with mosquitofish	1	ODFW	5		5			
3	3.7	Investigate non-native fish control strategies	4	ODFW	20	5	5	5	5	
3	4.1	Prepare and publish articles in appropriate popular literature	5	ODFW	10		2	2	2	
3	4.2.1	Develop interpretive displays	5	ODFW USFWS - OSO USFWS - WOR USFS ACOE	10 10 10 10 10	2 2 2 2 2	2 2 2 2 2	2 2 2 2 2	2 2 2 2 2	
TOTALS					1,732	239	355	327	297	

## APPENDIX 1

Conservation Agreement for the Oregon Chub  
in the Willamette Valley, Oregon

January 1992

Oregon Department of Fish and Wildlife  
Oregon Department of Parks and Recreation  
U. S. Army Corps of Engineers  
U.S. Bureau of Land Management  
U. S. Fish and Wildlife Service  
U.S. Forest Service

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## INTRODUCTION

The Oregon chub *Oregonichthys crameri* (formerly *Hybopsis crameri*), is a small cyprinid historically recorded only from the Willamette river drainage of Oregon. The Oregon chub has only recently been described as taxonomically distinct from the Umpqua chub *O. kalawatseti* (Markle et al. 1989, 1991). *O. crameri* was formerly widely distributed throughout the lowland areas of the Willamette valley but is now found only in and near Dexter and Lookout Point reservoirs, in the William Finley National Wildlife Refuge, and near Greens Bridge on the North Santiam River.

In 1974, Oregon State University fisheries professor Carl Bond noted the Oregon chub's uniqueness and apparent declining populations in the Willamette River watershed (Bond 1974). In the early 1980s, a series of studies on these fish was conducted by Oregon State University (OSU) with funding from the U.S. Forest Service (USFS), the U.S. Fish and Wildlife Service (USFWS), the Oregon Department of Fish and Wildlife (ODFW), and the OSU Agricultural Experiment Station. The first study (Long 1982) dealt with distribution. Two recently completed masters projects address taxonomic status and life history (Bills 1989, Pearsons 1989). Because of its greatly reduced distribution and continued threats, action must be taken soon to insure the continued survival of Oregon chub in the Willamette basin.

The USFWS has proposed to list the Oregon chub as an endangered species under the federal Endangered Species Act based upon a petition submitted by Markle and Pearsons (1990). The ODFW and Region 6 of the USFS list Oregon chub as a sensitive species. The Umpqua chub is not considered a sensitive species, nor is it proposed for listing under the federal ESA.

The Oregon Nongame Wildlife Plan (Marshall and Haight 1986) calls for identifying the status of sensitive species and for implementing needed protective measures. This conservation agreement for Oregon chub provides guidance for maintaining crucial habitats and establishing new populations in suitable habitats within the known historic range. Should Oregon chub be federally listed as endangered, this conservation agreement may serve as an effective starting point for the formal recovery planning process. Management considerations for Umpqua chub will be addressed in the ODFW Umpqua Basin Fish Management Plan.

## BIOLOGY

Historic habitats of the Oregon chub in the Willamette Valley were mainstem meanders and oxbows, stable backwater sloughs, marshes and beaver ponds. Remnants of these habitats where the Oregon chub still occurs usually have depositional substrate, gradually sloping banks, varied aquatic vegetation and other

hiding cover, little or no water velocity, depth mostly less than 6 ft, and summer water temperature exceeding 64°F. Oregon chub are opportunistic feeders with a diet of mostly zooplankters along with some chironomid larvae (Pearsons 1989). Sexually mature Oregon chub are longer than 35 mm and spawn in aquatic vegetation in still water from May to August (Pearsons 1989). Fecundity ranges from 147 to 671 eggs per female. The longest Oregon chub ever captured and measured was 69 mm (Pearsons 1989).

#### DISTRIBUTION AND ABUNDANCE

Prior to 1970, Oregon chub were collected from 21 Willamette Valley sites, in or near the Willamette River, as far downstream as Oregon City (Figure 1). Since 1970, none have been found associated with the mainstem Willamette. The Willamette basin was searched extensively in the 1980s for Oregon chub by the Oregon State University (OSU) Fisheries and Wildlife Department (Bond and Long 1984; Markle 1987; Markle et al. 1989). By 1987 the only known populations were in and above Lookout Point and Dexter reservoirs. In 1990 additional populations were found at Elijah Bristow State Park downstream from Dexter Dam and in Gray Creek on Finley National Wildlife Refuge. In 1991, a single chub was taken from a slough adjacent to Greens Bridge on the North Santiam River. Descriptions of these sites are in APPENDIX A.

Since the time when Snyder (1908) reported widespread distribution of Oregon chub in the basin, the off-channel habitat has been greatly altered by humans (Li, et al. 1987). Many of the meanders, oxbows, sloughs and side channels have been eliminated by channelization, diking, draining and filling. Large reservoirs have changed downstream patterns of flooding, streamflow and temperature. Various sources of pollution have reduced water quality. These activities typically have the greatest cumulative effects on low gradient and low elevation waterways well suited to the Oregon chub.

Within the same time period, non-native fishes were introduced and dispersed through the basin. Species such as largemouth bass *Micropterus salmoides*; bluegill *Lepomis macrochirus*; crappie *Pomoxis* sp.; bullhead catfish *Ameiurus* sp.; and mosquitofish *Gambusia affinis*, adapted well to Willamette Valley habitats preferred by Oregon chub. Predation upon and competition with Oregon chub undoubtedly resulted, although these interrelationships have had little study. Markle (1987) reported that centrarchids now occupy several sites where Oregon chub were once collected but are no longer found. Further introductions of non-native species in or near habitats occupied by Oregon chub could threaten the remaining populations.

Although habitat loss and introduction of exotic fishes are considered major reasons for the decline of the Oregon chub, other detrimental factors probably contributed. Markle (1987) observed that:

Physical, chemical and biological perturbations of habitat may explain why as many as two-thirds of the prime Willamette sites no longer have Oregon chub. However, at least a third of these prime sites seem 'pristine' and we are exploring the possibility that there may be other limiting factors such as summer water temperatures.

## MANAGEMENT OBJECTIVES AND GUIDELINES

ODFW, OSU and USFS began a series of meetings in 1987 to discuss the findings of recent research which indicated a pronounced contraction in the range of the Oregon Chub. Additional agencies have since participated. In recognition that several agencies at the state and federal levels have responsibilities for managing the Oregon chub and/or its habitat, the agencies involved concluded that a coordinated management plan would facilitate protection and recovery of the species. To that end, this Conservation Agreement was prepared as a guide for all agencies to follow as they conducted their missions.

### Goal

To reverse the declining trend of Oregon chub populations, and to increase the abundance of this species in healthy, wild populations through protection of habitat, re-introductions to suitable habitat within its historic range, and public education and involvement.

### Objectives

Objectives and guidelines for management of Oregon chub in the Willamette basin are:

Objective 1. Establish a task force drawn from participating agencies to oversee and coordinate Oregon chub conservation and management actions. The task force will include:

- Bureau of Land Management
  - Portland State Office
  - Eugene Field Office
- Oregon Department of Fish and Wildlife
  - Natural Production Program
  - Upper Willamette Fish District
- Oregon State University
  - Department of Fisheries and Wildlife
- U.S. Forest Service
  - Willamette National Forest
- U.S. Fish and Wildlife Service
  - Portland Field Office
- U.S. Army Corps of Engineers
  - Portland District, Willamette Valley Projects

The task force may include other agencies or individuals as appropriate.

Objective 2. Protect existing populations.

A. Implement habitat protection and improvement measures at known Oregon chub habitats. Potential measures, by site, are presented in APPENDIX A.

1) Prevent or minimize physical impacts by preventing water diversion or flooding, fill or removal, water temperature change or removal of cover. (Ongoing: USFS)

2) Prevent or minimize biological impacts by preventing introductions of non-native fish species, removing non-native species, and isolating Oregon chub populations from potentially introduced fish pathogens. (Ongoing: ODFW)

3) Prevent chemical impacts by prohibiting use of pesticides near Oregon chub habitat and reducing the risk of accidental spills of toxicants. (Ongoing: USFS)

B. Periodically assess Oregon chub populations at known sites. (Ongoing: ODFW, OSU)

C. Continue surveying likely habitat to identify undocumented Oregon chub populations. (Ongoing: ODFW, OSU, USFS)

D. Develop interagency management plans for Dexter and Lookout Point reservoirs that prescribe measures to protect and improve existing populations of Oregon chub and their habitat. (USFS, USACE)

Objective 3. Establish new populations.

A. Develop and rank a list of sites for introductions. APPENDIX B presents a preliminary list of sites for the interagency task force to consider. These sites will require more information before decisions are made about rank, budget and time frame for introductions.

B. Introductions of Oregon chub will follow the guidelines in APPENDIX C.

Objective 4. Foster greater public understanding of the Oregon chub, its status, the factors that influence it, and this conservation agreement.

A. Publish articles in appropriate popular literature.

B. Educate the public about efforts to maintain and increase Oregon chub and the risks of introducing exotic species.

### Agency Responsibilities

A number of state and federal agencies must be involved to implement the Oregon Chub Conservation Agreement. Each agency will pursue its responsibilities consistent with its authority under state or federal law.

ODFW is responsible for direct management of fish species. ODFW issues permits required to conduct introductions of fish and will be the primary agency responsible for conducting and evaluating introductions of Oregon chub. ODFW will assume the lead role in informing the public about the Oregon chub and its management.

Oregon Parks and Recreation Department (OSPR) will maintain existing Oregon chub habitat in Elijah Bristow State Park and will coordinate with ODFW on reintroductions of Oregon chub on state park lands. OSPR will evaluate and approve ODFW proposals for reintroductions of Oregon chub in areas that would affect state park lands or the Willamette River Greenway. Reintroductions will be consistent with other park resource values and recreational uses. OSPR has secondary responsibilities for public education about the Oregon chub on state park lands.

USFS will maintain and improve Oregon chub habitats on National Forest land. USFS will locate and develop introduction sites on the Willamette National Forest and also will participate in public information and interpretation efforts on lands under its management.

USACE manages water levels in Dexter and Lookout Point reservoirs, and manages the habitat in Dexter Reservoir, a portion of Lookout Point Reservoir and several potential introduction sites.

USFWS manages Finley National Wildlife Refuge and has proposed to list the Oregon chub as endangered under the federal ESA. Should the Oregon chub be listed, USFWS would be responsible for administering the Endangered Species Act, as circumstances require, including preparation of an appropriate recovery plan.

The Bureau of Land Management (BLM) will cooperate in inventory and monitoring activities, and in locating sites for Oregon chub re-introductions.

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Table 1: Willamette River valley localities where Oregon Chub have been collected.

County	Location	pre-1970	1970-80	1981-89	1990-91
<b>Clackamas</b>	Willamette River, Oregon City	X	\	\	
	Clear Creek, Oregon City	X	\	\	
<b>Marion</b>	ODFW Ponds, Aumsville	\	X	\	\
	Greens Bridge, N. Santiam River	\	X	\	X
	N. Santiam River (Stayton-Sheldon)				\
	Ankeny National Wildlife Refuge				\
<b>Polk</b>	Cooper Hollow Creek, near mouth	X	\	\	
	Baskett Slough National Wildlife Refuge				\
<b>Linn</b>	S. Santiam River, Lebanon	X	\	\	
	"The Lakes", Albany	X	\	\	
	Calapooya River, Fitzgibbon	X	\	\	
	Willamette River, Peoria	X	\	\	
<b>Benton</b>	Willamette River, Corvallis	X	\	\	
	Buchanan Pond, Corvallis				\
	Beaver Pond, Finley Refuge				\
	Cattail Marsh, Finley Refuge	X	\	\	\
	McFadden Marsh, Finley Refuge	X	\	\	\
	Gray Creek, Finley Refuge				X
	Cabell Marsh, Finley Refuge				\
	Brown Swamp, Finley Refuge				\
	Long Tom River, Monroe	X	\	\	
<b>Lane</b>	Willamette River, Eugene	X	\	\	
	McKenzie River, Eugene	X	\	\	
	Dexter Reservoir	X	X	X	
	Lookout Point Reservoir	X	X	X	
	Shady Dell Campground	X	X	X	
	Buckhead Creek Slough	\	X	X	
	Ferrin Campground	\	\	X	
	Gravel pits at Saginaw	X	\	\	
	Coast Fork, Willamette River, Cottage Grove	X	\	\	
	Cottage Grove Reservoir	X	\	\	
	Elijah Bristow State Park				X

X: collected; \: not collected

Sources: Bond and Long 1984, Pearsons 1989,  
Shafer, Scheerer and Jones 1991

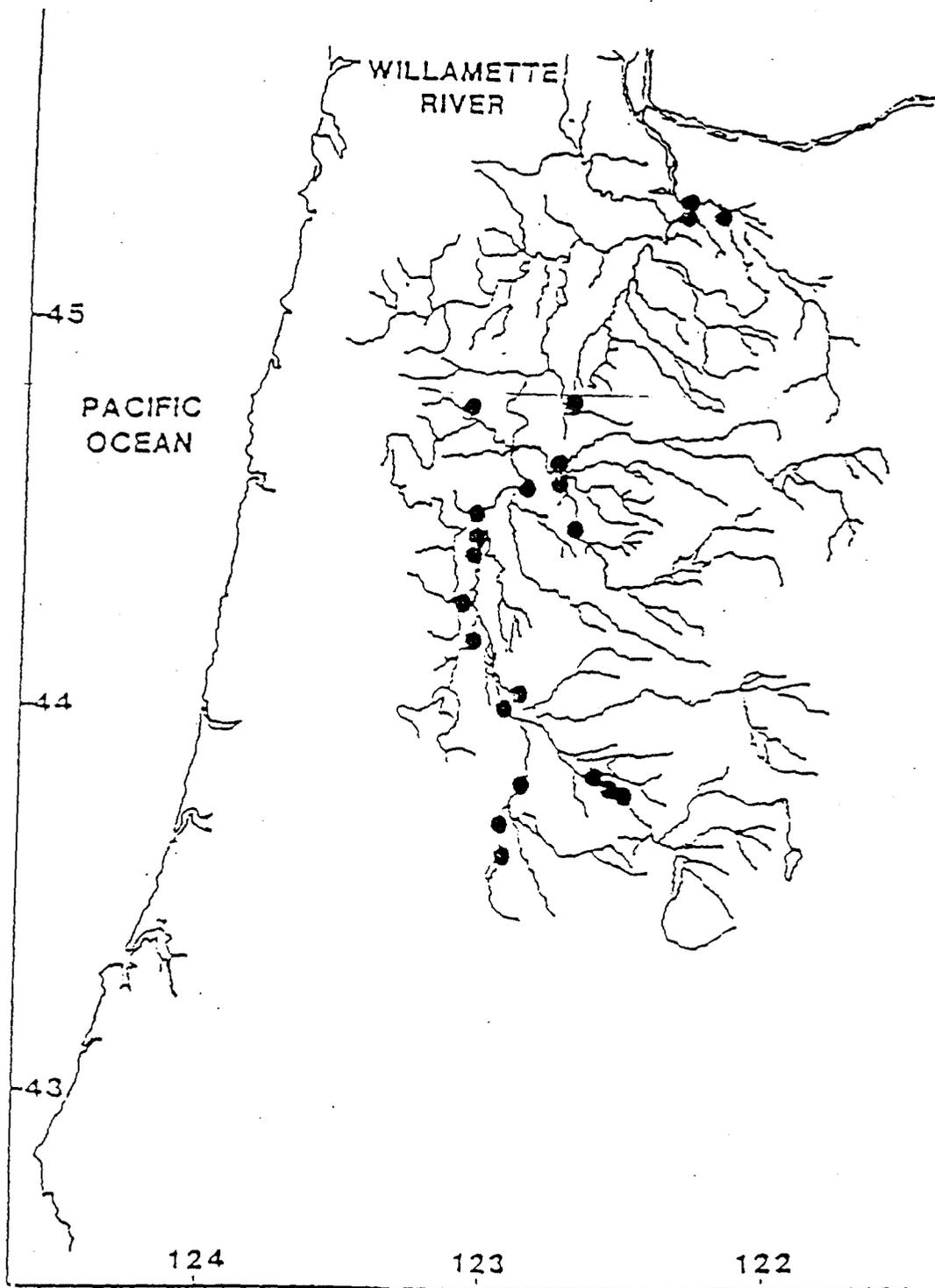


Figure 1. Historical distribution of Oregon Chub in the Willamette basin.

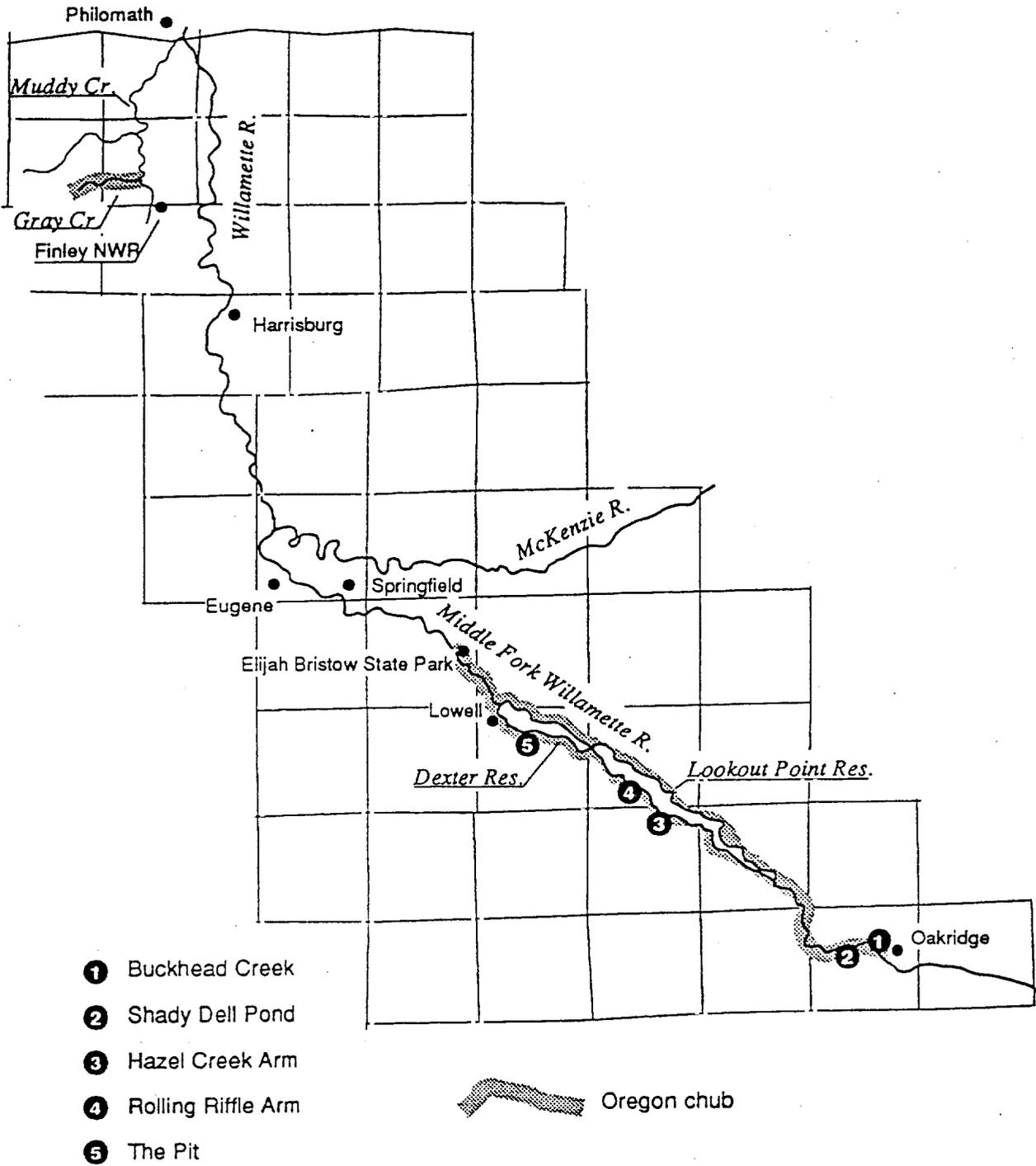


Figure 2 a. Current distribution of Oregon chub in the Willamette Basin.

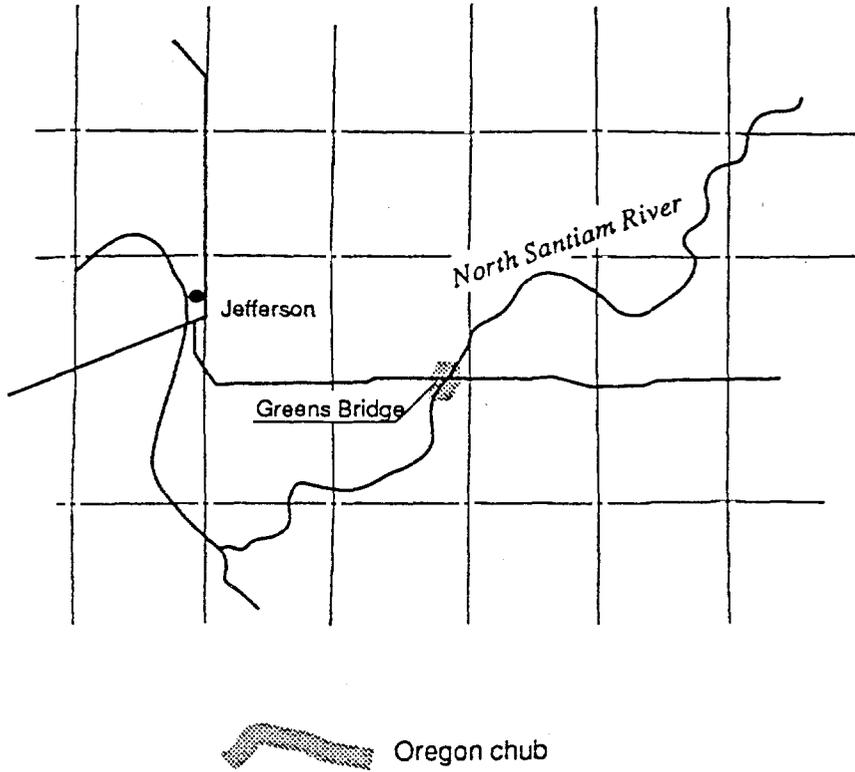


Figure 2 b. Current distribution of Oregon chub in the Willamette Basin.

## APPENDIX A

### Descriptions of and Management Options for Willamette Valley Sites Inhabited by Oregon Chub

#### BUCKHEAD CREEK

Buckhead Creek (Figure 2a) is located 2 miles above Lookout Point Reservoir on the Willamette National Forest. The lower portion of the creek flows through a mile long, slough-like, abandoned channel of the Middle Fork Willamette River. The channel varies from a few feet to over 50 feet wide with both sloping and undercut banks and a bottom composed of silt, boulders, gravel and detritus. Some woody debris and aquatic vegetation, mainly *Elodea* sp., contribute to the Oregon chub habitat. The water is slightly turbid and mostly shallow. Maximum water temperature recorded by Pearsons (1989) was 72°F.

Long (1982) found Oregon chub to range from "scarce" to "abundant" at various sampling stations. Other species recorded were largescale sucker *Catostomus macrocheilus*, northern squawfish *Ptychocheilus oregonensis*, redbelt shiner *Richardsonius balteatus*, cutthroat trout *Oncorhynchus clarki*, and sculpin *Cottus* spp. Although the total number of Oregon chub is probably higher in Buckhead Creek than in Shady Dell or "The Pit", their density is lower.

The Buckhead Creek area receives protection through a USFS wildlife management plan. A nature trail and overhead powerline are the only existing or planned developments. Access to the site is via a Lane County gravel road and USFS road 5821 that skirts the east side of the middle fork Willamette River. A Southern Pacific Railroad main line forms the east and north boundaries of the management area. Possible actions to protect Oregon chub include creating additional cover, expanding or stabilizing existing pool areas and working with the Bonneville Power Administration and Southern Pacific Railroad to minimize the risks associated with the spraying of vegetation for power and railway corridor maintenance.

#### SHADY DELL POND

This site is located in a USFS campground along the south side of State Highway 58 across the Middle Fork Willamette River from Buckhead Creek (Figure 2a). A small pond, about 1/2 acre when full, was formed when highway construction isolated a portion of the river channel. Banks slope gradually, and the bottom is a mix of detritus, silt, and boulders. Water is usually slightly turbid. Several species of aquatic plants are present in moderate abundance. Pearsons (1989) observed that aquatic

vegetation in the pond appears important for spawning of Oregon chub. The pond is fed only by rainfall and seepage and has no obvious outlet. The pond reaches a maximum depth of 6 ft in winter and is mostly less than 3 ft deep in summer. Evaporation, leakage, or both, cause the pond and its fringe marsh to shrink substantially in summer. Since 1986 USFS has diverted flow from nearby Shady Dell Creek into the pond when its level becomes dangerously low; the intake has narrow slots to prevent the entry of cutthroat trout into the pond. The highest temperature recorded by Pearsons (1989) was 88°F.

Long (1982) classified the population of Oregon chub, speckled dace *Rhinichthys osculus*, and prickly sculpin *Cottus asper*, as "scattered," and reidside shiner and cutthroat trout as "rare." Pearsons (1989) estimates that Oregon chub now form over 90 % of the fish population. He also notes presence of a few largescale suckers, which Long (1982) did not report.

Possible actions to protect Oregon chub are maintaining adequate depth in the pond; maintaining or strengthening the State Highway 58 guardrail to reduce the risk of spills; working with the Oregon Department of Transportation to minimize the risks associated with the spraying of roadside vegetation; controlling undesired fish species; and isolating the pond from campground activities.

#### LOOKOUT POINT RESERVOIR

This USACE reservoir, completed in 1954, is located on the Middle Fork Willamette River about 20 miles southeast of Eugene. Surface area of the reservoir fluctuates from 4,360 acres at full pool in summer to 2,090 acres at minimum pool in winter with a drawdown of 107 ft. Because of generally steep banks, shoal area important to many juvenile fish and to fish food production is limited at any pool level. The bottom is composed mainly of silt, with compacted rubble and gravel in the inundated river channel. The water is often turbid from shoreline wave action and suspended clay from Hills Creek Reservoir. Aquatic vegetation is sparse and other underwater cover is generally lacking.

As a result of this harsh environment, few fishes other than largescale sucker and northern squawfish thrive in the impoundment. Those two species composed about 90% of gillnet catches during intensive fish sampling in 1983 (Bond 1984). Also captured were 13 other species, including one Oregon chub.

In 1957 Oregon chub were collected at eight locations in the new reservoir. At sampling sites near the head of the impoundment they were recorded as "abundant" (Hasselman and Garrison 1957). In the summer of 1986, Pearsons searched Lookout Point Reservoir and found several hundred Oregon chub confined almost entirely in upper ends of the Hazel Creek and Rolling Riffle arms of the

reservoir. From all indications, the Lookout Point population of Oregon chub has diminished greatly since the 1950s.

In spring 1988, USFS and ODFW placed a 1/2-inch mesh screen across the Highway 58 culvert in the Hazel Creek arm (Figure 2a) as the embayment began filling with water rising from the reservoir. The purpose of the screen was to allow passage of Oregon chub to and from the embayment in summer, while excluding large predatory fish. Snorkel surveys documented use of the area by redbreasted shiners, but no Oregon chub were observed. ODFW seined the embayment as the water level dropped in late summer and found several Oregon chub and no large predators. In spring 1989, the screen was installed again. Seining in late August caught thousands of dace, a few young of the year largemouth bass and several hundred Oregon chub. While the screen was being removed several days later the presence of approximately 100 chinook salmon *Oncorhynchus tshawytscha*, and cutthroat trout was noted. It appears that considerable numbers of Oregon chub remain at least seasonally in the arms of Lookout Point reservoir. In 1990 the screen was not operated and 325 Oregon chub were seined from the Hazel Creek Arm and transferred to Dorena Pond. No Oregon chub were captured at Dorena Pond during 1991 surveys.

Some actions to consider for protecting Oregon chub in Lookout Point Reservoir include evaluating impacts of and attempting to control predaceous fish, developing refuge areas with good hiding cover at full and minimum pool levels, and continuing USFS efforts to establish more vegetative cover in the drawdown zone.

#### DEXTER RESERVOIR

Dexter is a USACE reregulating reservoir located immediately downstream from Lookout Point Dam (Figure 2a). Also completed in 1954, it covers 1,025 surface acres and is not drawn down for flood control in winter. However, water level does fluctuate 1 to 4 ft daily in response to power generation at Lookout Point Dam. The bottom is mostly silt, with clean rubble and large gravel present in the inundated river channel near the head of the reservoir. Shoal habitat is more plentiful than in Lookout Point Reservoir, especially along the north shoreline. Sparse to moderate aquatic vegetation is scattered along the perimeter, contributing to favorable habitat for Oregon chub and other fishes.

The Pit is an embayment lying next to the south shoulder of State Highway 58 and is connected by an underwater culvert beneath the highway to Dexter Reservoir (Figure 2a). Ownership was deeded to the Oregon Highway Commission in 1960; the area is under USACE jurisdiction via a flowage easement. The Pit is about 80 ft long, 30 ft wide and 4-5 ft deep. The bottom is composed mostly of silt. Banks are sloping and support shrubs and emergent aquatic vegetation except along the highway side, which consists of large boulder riprap. Woody debris, a riprap bank and

submerged aquatic vegetation offer diverse fish habitat. A small, intermittent stream enters from the south.

All or most fish species found in Lookout Point Reservoir are also in Dexter Reservoir. Although northern squawfish and largescale suckers are abundant, the prevalent species in Dexter is probably redbside shiner. Sampling has been insufficient to determine a trend in the population of Oregon chub. OSU professor Douglas Markle reports that Oregon chub were plentiful in the reservoir near The Pit during snorkeling observations in 1988. Sampling at The Pit by OSU students in 1987 found about 400 redbside shiner, 300 Oregon chub, 50 northern squawfish and 5 sculpin. A few northern squawfish seen in 1988 approached 1 ft in length. All species present probably have access to and from Dexter Reservoir via the culvert.

Oregon chub enhancement projects to consider at Dexter and The Pit include: encouraging growth of aquatic vegetation in shoal areas; developing other forms of cover in shallow water; controlling undesired species, working with the Oregon Department of Transportation and the local power company (an overhead line crosses The Pit) to minimize the risks associated with herbicide spraying along roadway and powerline corridors; and maintaining and strengthening the highway guardrail to minimize the risk of accidental spills into The Pit.

#### BERRY SLOUGH

Berry Slough enters the Middle Fork Willamette River about 2 1/2 miles below Dexter Dam. Almost the entire 1 mile length lies within Elijah Bristow State Park (Figure 2a). The slough appear to be an abandoned river channel and consists of a chain of shallow ponds connected by a spring fed flow of several cubic feet per second.

An apparently abundant population of Oregon chub was discovered throughout the slough in 1990. Speckled dace, redbside shiners, sticklebacks, and cottids were also abundant. A few coarsescale suckers and one juvenile largemouth bass were also caught.

A more extensive survey of the habitat and fish populations is needed. Protective measures include maintaining the current low level of development near the slough and talking to the landowner at the upper end of the slough about not introducing fish.

#### GRAY CREEK

The Gray Creek site is located near the southwest corner of William L. Finley National Wildlife Refuge, Benton County (Figure 2a). Gray Creek originates on the slopes west of Bellfountain Road. This area is owned by private timber companies. The creek flows under Bellfountain Road onto Finley NWR where three dikes have been constructed to form Beaver Pond, Cattail Pond and Cabell Marsh. The waters of Gray Creek finally empty into Muddy

Creek which drains into the Willamette River south of Corvallis. Gray Creek has been extensively dammed by beavers between Bellfontain Road and the first dike at Beaver Pond. This has resulted in a narrow band of marsh habitat less than one mile in length. The substrate is primarily silt and detritus. Dense vegetation (Reed canary grass *Phalaris arundinacea*, bullrush *Scirpus microcarpus*, and cattail *Typha latifolia*) surround a series of small ponds. (Township 13S, Range 5W, Section 31). The refuge boundary in this area is irregular and portions of the marsh are within the refuge boundaries while other portions are located on private land. Steep, forested slopes rise up on either side of the marsh; the north slope is refuge land while a large portion of the southern slope is private land.

This area is within the historic range of the Oregon chub and a specimen was collected at Cabell Marsh in 1938 (OSU9600). A refuge checklist compiled in 1973 listed Oregon chub as present at Finely NWR, but in limited numbers. Four juvenile Oregon chub were collected from Beaver Pond in 1987 (Markle et. al. 1989), but subsequent sampling of Beaver Pond in 1989 was unsuccessful. Beaver Pond completely dried during the summer of 1988, but water remained in the series of ponds maintained by beavers upstream of the manmade "Beaver Pond". During a quick survey of this upstream area in 1990, Markle collected one adult and again documented the existence of Oregon chub in this drainage. More extensive surveys by ODFW in 1991 also documented Oregon chub in the upstream marsh area while none were found in Beaver Pond (Scheerer et al 1991). In addition to Oregon chub, reddsideshiners *Richardsonius balteatus*, bullhead *Ameiurus* sp., threespine stickleback *Gasterosteus aculeatus*, speckled dace, *Rhinichthys osculus*, and sculpin *Cottus* spp. are present at this site. Bullfrog adults and tadpoles are also abundant.

There are several potential threats to this site. The steep slopes south of the site are forested and privately owned. Logging of this area could have significant negative impacts on the chub habitat. Many of the forested areas near the refuge have been clearcut and converted to Christmas tree plantations. If the slopes west of Bellfontain Road were converted in this manner, levels of fertilizer, pesticides and silt in the water would increase. The fish assemblage at the Gray Creek site is dominated by native species. Downstream of the dike at Beaver Pond, exotic fish species are abundant (bullhead *Ameiurus* sp., carp *Cyprinus carpio*, mosquito fish *Gambusia affinis*, bluegill *Lepomis macrochirus*, and crappie, *Pomoxis* sp.). The migration of exotic species upstream through the culvert at the Beaver Pond dike could have serious negative effects on Oregon chub.

#### GREENS BRIDGE

Greens Bridge is located on the North Santiam River at the crossing of Shelburn Drive (Figure 2b). A single Oregon chub 42 mm in length was collected in a slough to the north of Greens Bridge in 1991. The slough is open to the river channel at the

south (downstream) end; the upstream end is blocked by cobble and gravel which permit water percolation. The slough bottom is silt; maximum depth is approximately 0.5 meter. Slough area is approximately 4800 square meters. Rooted aquatic vegetation (water milfoil, reed grass and bullrush) covers approximately 45% of the slough bottom. Other fish species found at the site include threespine stickleback *Gasterosteus aculeatus*, redbreasted shiner *Richardsonius balteatus*, and sculpin *Cottus spp.*

## APPENDIX B

### Potential Sites to Introduce Oregon Chub

Aumsville Ponds. Located in Marion County; owned by Marion County; 2 acres; contains brown bullhead; upper pond appears best; Oregon chub present in late 1970s; abundant vegetation.

Baskett Slough. Located in Polk County; part of Baskett Slough National Refuge; owned by U.S. Fish and Wildlife Service; size and condition of ponds unknown; fish species present unknown.

Cronemiller Lake. Located in Benton County; owned by Oregon State University; 3 acres; fish present unknown; habitat appears good.

Dexter Pond. Located in Lane County; owned by U.S. Army Corps of Engineers; 2 acres; contains mosquito fish; below Dexter Dam behind locked gates; dense aquatic vegetation.

Dorena Pond. Located in Lane County; owned by U.S. Army Corps of Engineers; 1.5 acres; contains largemouth bass; in Schwartz Park below Dorena Dam; habitat appears good; small inlet stream; 325 Oregon chub transplanted from Lookout Point Reservoir in 1990; no chub were captured during 1991 survey.

Eugene Airport Pond. Located in Lane County; owned by City of Eugene; 1-2 acres; fish species present unknown; two ponds behind cyclone fence; no inlet or outlet; habitat appears good.

Ferrin Pond. Located in Lane County; owned by U.S. Forest Service; 4 acres; contains cutthroat trout, largemouth bass, mosquito fish; adjacent to Middle Fork Willamette River near Oakridge; habitat appears good; needs outlet structure. Other ponds adjacent.

Hills Creek Pond. Located in Lane County; owned by U.S. Army Corps of Engineers; 2 acres; contains largemouth bass; just below Hills Creek Dam; inlet (spring) and outlet may need improvement; habitat appears good.

Jessen Drive Pond. Located in Lane County; owned by Oregon Highway Department; 3/4 acre; fish species present unknown; shallow with aquatic vegetation; no inlet or outlet; becomes low in fall.

Luckiamute Pond. Located in Polk County; ownership unknown; 1 acre; shallow with aquatic vegetation; along logging road; T9S, R7W, Section 34.

Wicopee Pond. Located in Lane County; owned by U.S. Forest Service; 1 acre; contains cutthroat trout; along State Highway 58 at Wicopee Road Bridge over Salt Creek; needs inlet and outlet improvement; Oregon chub introduced in 1988, but not found in 1989 surveys; shallow with vegetation.

Wildish Ponds. Located in Lane County; owned by Wildish Sand and Gravel; 1-20 acres; fish species present unknown; several ponds behind gates near confluence of Middle and Coast Fork Willamette River; habitat appears good.

## APPENDIX C

### Guidelines for Reintroducing Oregon Chub into Their Historic Range

The following guidelines for reintroductions of Oregon chub are adapted from Williams et al. (1988). These guidelines are consistent with ODFW policy and responsibility for finfish introductions (ODFW 1982).

#### SELECTING INTRODUCTION SITES

1. Restrict introductions to the historic distribution.
2. Restrict introductions to protected sites which are secure from imminent or future threats of habitat destruction.
3. Restrict introductions to sites where the potential for dispersal has been determined and is acceptable.
4. Restrict introductions to sites that likely fulfill life history requirements. Features include: small ponds, less than 3,000 ft elevation, depositional substrate, gradually sloping banks, varied aquatic vegetation, little or no water velocity, mostly less than 6 ft deep, limited use or access by the public, no exotic fish species, and summer water temperature exceeding 64°F. Site manipulations to comply with this guideline are permissible. Introductions and site manipulations will be coordinated with landowners of proposed sites. Develop a post-introduction site management plan prior to introduction and coordinate with landowner and/or managing agencies.
5. Restrict introductions to sites that contain sufficient habitat to support a genetically viable population.
6. Prohibit introductions into areas where other rare or endemic taxa could be adversely affected.

#### CONDUCTING INTRODUCTIONS

1. Obtain introduction stock of sufficient number and character. If the source population is not threatened by imminent loss, no more than 10% of the population should be removed annually.
2. Consult an ODFW pathologist regarding the presence of undesirable pathogens.

3. Introduce stock under most favorable weather and hydrologic conditions. Avoid transfers during the spawning season.
4. Document date, number stocked, source and receiving waters, and persons conducting the introduction.

#### POST-INTRODUCTION ACTIVITIES

1. Conduct systematic monitoring of introduced populations.
2. Determine cause of unsuccessful introductions.
3. Restock if warranted.
4. Document findings and conclusions.

IT IS MUTUALLY AGREED THAT

MAR 13 1992

1. The signing agencies will mutually develop operational plans to determine specific details and timing of projects through the interagency task force to implement this conservation agreement for Oregon Chub. It is also understood that the OREGON DEPARTMENT OF FISH AND WILDLIFE holds the primary responsibility for determining the locations of stocking and the numbers of Oregon chub to be stocked, and for carrying out the stockings..

2. Representatives of the agreeing agencies will meet each year to assess progress toward the stated goal.

3. Nothing herein shall be construed as obligating the FEDERAL AGENCIES to expend, or as involving the United States in any contract or other obligation for further payment of money in excess of appropriations authorized by law.

4. This AGREEMENT becomes effective at the last date of the signatures below and the AGREEMENT will remain in effect unless terminated by any party upon thirty (30) days written notice by any party to the others.

*Randy Fisher*  
Randy Fisher  
Director  
Oregon Department of Fish  
and Wildlife

1/23/92  
Date

*Jack Wiles*  
Jack Wiles  
Supervisor, Region 1  
Oregon Parks and Recreation  
Department

1/24/92  
Date

*Charles A.W. Hines*  
Charles A.W. Hines  
Colonel, Corps of Engineers  
District Engineer

3 Apr 92  
Date

*Robert D. Bibler Jr.*  
Dean Bibler  
State Director  
U.S. Bureau of Land Management

MAY -8 1992  
Date

*Marvin L. Plenart*  
Marvin L. Plenart  
Regional Director  
U.S. Fish and Wildlife Service

February 27, 1992  
Date

*Darrel L. Kenops*  
Darrel L. Kenops  
Supervisor, Willamette  
National Forest  
U.S. Forest Service

3/10/92  
Date

## APPENDIX 2

### Summary of Comments on the Draft Recovery Plan for the Oregon Chub.

#### I. Background

In April 1998, we (the U.S. Fish and Wildlife Service) released the draft recovery plan for the Oregon chub for a 60-day comment period, which ended June 22, 1998. Almost 100 copies of the draft recovery plan were sent out for review during the comment period, including 4 to peer reviewers.

Nine comment letters were received. Most of the letters provided specific comments on wording, clarity, and advice on refining individual recovery tasks. These comments were incorporated, as appropriate, into the final recovery plan, and are not discussed further here. Issues raised during the public comment period that were not completely addressed or incorporated into the final recovery plan are discussed below.

Of the nine comment letters received, three were from other Federal agencies (Army Corps of Engineers, U.S. Forest Service - Willamette National Forest, and U.S. Fish and Wildlife Service - Western Oregon National Wildlife Refuge Complex). Four comment letters were received from state agencies (Oregon Parks and Recreation Department, Oregon Department of Fish and Wildlife - Portland, Corvallis, and Springfield offices). Two comment letters were received from peer reviewers at Oregon State University and Washington Department of Fish and Wildlife. Comment letters on the draft plan are on file at the U.S. Fish and Wildlife Service's Oregon State Office, 2600 S.E. 98<sup>th</sup> Avenue, Suite 100, Portland, Oregon 97266.

#### II. Summary of Major Comments and Service Responses

**Issue 1:** Why does the plan focus on public lands and assume that recovery cannot take place on private lands?

**Response:** The plan states that public lands will be the focus of recovery efforts because of their greater likelihood of stable, long-term management, but that private lands will not be categorically excluded. Where private landowners are willing to manage their lands over the long term to benefit Oregon chub, those opportunities will be evaluated using the same criteria applied to public lands. In fact, we have provided grants to some landowners through the Partners For Wildlife program to enhance habitat for Oregon chub on private lands.

**Issue 2:** The recovery section of the plan should assign actions to specific agencies.

**Response:** The responsible agency(s) for each task recommended in the plan is given in the Implementation Schedule.

**Issue 3:** Several commenters suggested that the Implementation Schedule should use a more detailed priority system.

**Response:** The priorities established in the Implementation Schedule are defined by us and used in all recovery plans. Priority 1 tasks are actions that must be taken to prevent extinction or to prevent the species from declining irreversibly; priority 2 tasks are actions that must be taken to prevent a significant decline in species population or habitat quality, or other significant adverse impact short of extinction; priority 3 tasks are all other actions necessary to provide for full recovery of the species. The Implementation Schedule assigns priority 2 to over 70 tasks. Further refinement of the priorities within this grouping is needed, and would be appropriately addressed by the Oregon Chub Working Group.

**Issue 4:** The draft recovery plan recommends management of populations in isolation with little opportunity for genetic mixing. This could contribute to inbreeding or other undesirable genetic consequences.

**Response:** The final recovery plan was revised to favor recovery in more natural sites, with connections to other occupied habitats. This emphasis on less

isolated populations should alleviate some of the concerns about the genetic makeup of chub populations at recovery sites. In addition, the revised recovery plan also stresses that stock for new introductions should come from a variety of existing populations within the same sub-basin to ensure a diverse genetic makeup.

**Issue 5:** The draft recovery plan relies too heavily on intensive management of isolated populations, and does not seek to determine the conditions under which Oregon chub could coexist with non-native fish predators and competitors. The recovery plan should devise a research program aimed at sustaining populations of Oregon chub in habitats that will not require permanent management.

**Response:** Non-native fish are widely distributed in the Willamette Valley, and unfortunately must be considered a permanent feature of the region. Our experience with existing Oregon chub populations has shown that the species does not thrive in any habitats where exotic fish are found. Although the plan recommends research into feasible methods for eradication of non-native fish, this will probably only be an option in isolated habitats. The final plan has been modified from the draft to recommend reestablishment of Oregon chub into more natural habitats in areas of restored floodplain, but it remains to be seen whether Oregon chub will be able to persist in even small numbers where non-native predators and competitors are established.

As for research into the environmental conditions that would allow coexistence of Oregon chub and non-native fish, one reviewer recommended a program of long-term, field-based experiments which would include managed and unmanaged sites, along with control sites lacking non-natives. This may be accomplished through adaptive management of new introduction sites. Careful monitoring of the success of Oregon chub reintroductions should provide important insights into the conditions under which populations thrive or decline.

Thus, the final plan opts for a combination of approaches to recover the Oregon chub — from isolated, intensively managed ponds to more natural

restored floodplain habitats. It is likely that populations will fall all along this spectrum, and that Oregon chub recovery will be achieved through a variety of strategies.

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U.S. Fish and Wildlife Service  
Ecological Services  
911 N.E. 11th Avenue  
Portland, Oregon 97232-4181**



**September 1998**